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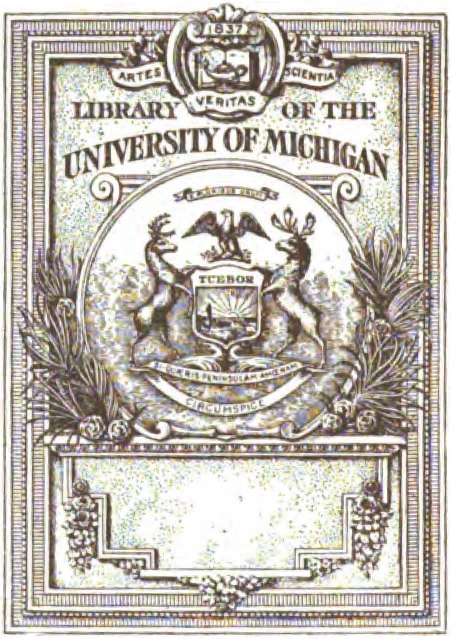
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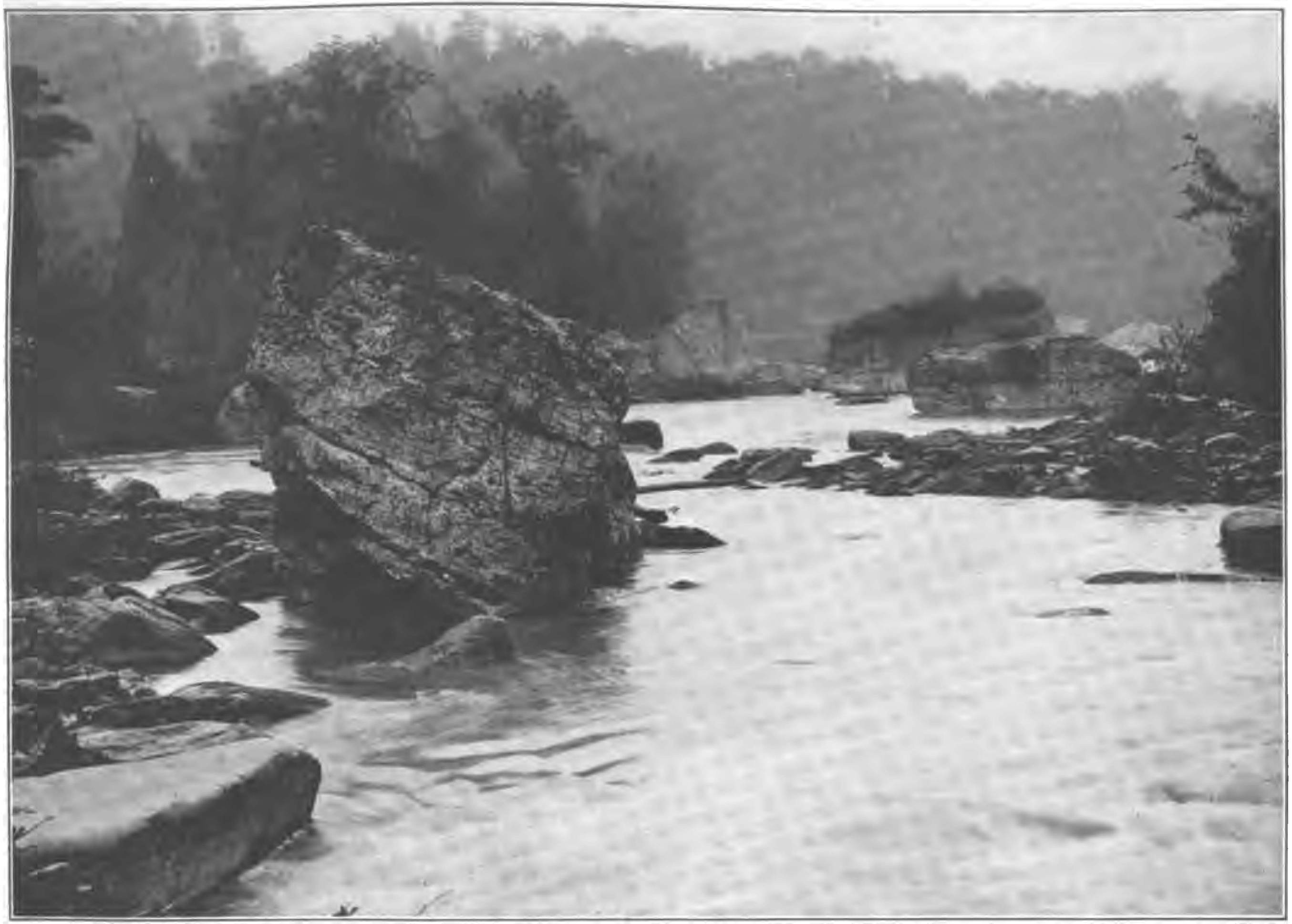

PLATE I.—Looking up Tygart Valley River from point 0.9 mile west of Harding, Randolph County, showing great boulders from Homewood and Upper Connoquenessing Sandstone cliffs; topography of the Allegheny and Pottsville Series.

WEST VIRGINIA

GEOLOGICAL SURVEY

Barbour and Upshur Counties and Western Portion of Randolph County

By

DAVID B. REGER, Assistant Geologist

Assisted by

D. D. TEETS, Jr., Field Assistant

With

INTRODUCTION by

I. C. WHITE, on Deep Well Borings and

C. E. VAN ORSTRAND on Deep Well Temperatures.

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LETTER OF TRANSMITTAL.

To His Excellency, Hon. John J. Cornwell, Governor of West Virginia, and President of the State Geological Survey Commission:

SIR:

I have the honor to transmit herewith the Detailed Report and Topographic and Geologic Maps, each in two sheets, covering the Counties of Barbour, Upshur, and the adjoining portion of Randolph west from Big Laurel and Rich Mountains. This western portion of Randolph contains the principal coal area of that county and as its coal beds are continuous with those of Barbour and Upshur, it was concluded to include the description of the same with the Report on the latter counties rather than await the publication of the separate Report on Randolph County which might be delayed for several years.

The Survey was fortunate in being able to entrust the preparation of this Report to two of its employees who, born in Upshur and grown to manhood therein, were naturally quite familiar with much of this area from early boyhood. How well David B. Reger, Assistant Geologist, in charge of the work, and his Aid, D. D. Teets, Jr., have performed their allotted task, this large and instructive volume and its accompanying maps replete with detailed information on the minerals and other natural resources of the areas described bear eloquent testimony.

In addition to the valuable paper by Dr. Price, the Paleontologist of the Survey, given in Part IV, the State Geologist has added to this volume an Introductory article on the results of Deep Well Drilling not only in West Virginia but also in the adjoining States of Ohio and Pennsylvania. Through the courtesy of John G. Pew, President of the Peoples Natural Gas Company, and of John B. Corrin, Vice-President of the Hope Natural Gas Company, the writer is able to present in this Introduction the detailed record of the deepest boring ever yet made in the world's history; viz. that on the Martha O. Goff farm, 8 miles northeast from Clarksburg, Harrison County, West Virginia, as also the record of the next deepest well in America and the third deepest in the world, (the one drilled by the German Government at Czuchow in Silesia to a depth of 7349 feet ranking second); viz, that on the R. A. Geary farm near McDonald, Washington County, Pennsylvania, as also the records of several other deep oil and gas wells drilled in West Virginia, since the forms for the main volume were closed. The Survey is also under many obligations to Dr. Geo. Otis Smith, Director of the U. S. Geological Survey, and to Dr. David White, Chief Geologist of the same, for their courteous cooperation in sending Mr. C. E. Van Orstrand, the expert Physical Geologist of the U. S. Geological Survey, to make a series of earth temperature determinations in these deep borings through the cheerful cooperation of the two gas companies mentioned. This series of earth temperatures made at depths never before penetrated, and with greater care and accuracy than ever heretofore attained, forming a splendid contribution to pure science, is added to this Introductory paper through the courtesy of the U. S. Geological Survey authorities, and Mr. C. E. Van Orstrand whose patient and skillful work is modestly described by him in the splendid paper added hereto. Mr. Van Orstrand also describes and illustrates for the first time a new mechanical device for rapidly and accurately measuring the depth of deep drill holes, thus effecting a great saving in valuable time of the entire drilling crews.

Not the least interesting of the scientific results obtained from the deep well on the M. O. Goff land is the finding of fossil marine animal life buried under nearly a mile and a half of sedimentary strata as described in the communication from Charles Butts, Geologist of the U. S. Geological Survey, in his letter to the State Geologist under date of April 22nd, 1918, and quoted in the Introduction. These identifications demonstrate anew the order and harmony of the history of life upon the earth even when the muddy sediments in which these once living organisms were entombed are so deeply buried from ordinary inspection.

The Soil Survey of Barbour and Upshur Counties was completed during the field season of 1917 through cooperation with the U. S. Bureau of Soils, and the Soil Report and Soil Maps of this area will be published in the near future. The West Virginia Geological Survey will purchase an edition of 2500 copies direct from the Public Printer at only a slight advance above the cost of paper and printing, and distribute them to all who receive this volume.

I. C. WHITE,
State Geologist.

Morgantown, W. Va.,
July 1, 1918.

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AUTHOR'S PREFACE.

This book contains a short historical and industrial sketch, a chapter on Physiography, seven chapters on Stratigraphy, four chapters on Mineral Resources, and a chapter on Paleontology, and an Introductory article by the State Geologist on Deep Well Records, including an article by C. E. Van Orstrand, Physical Geologist, of the U. S. Geological Survey on "Apparatus for the Measurement of Temperatures in Deep Wells, and Temperature Determinations in Some Deep Wells in Pennsylvania and West Virginia".

In order to describe the several coals and the oil and gas sands in their proper stratigraphic sequence, it was necessary to make an exhaustive study of the entire rock system, both surface and underground, as far as possible, the results of which are embodied in the text in the form of geologic sections and detailed descriptions. This matter may not be of interest to the casual reader but its value to professional men conducting future coal, oil, and gas operations in the three counties can not be questioned. In each geologic section, certain physical facts, including thicknesses, intervals, colors, and general characters of rock strata and coals are presented just as obtained by careful research in the field, which subsequent investigation can not change. These facts are followed by the author's interpretation or correlation, based in some cases on opinion where certain essential facts are lacking, and some of these will doubtless require revision after the more detailed researches of future workers in particular localities. On all such points the author will welcome kindly criticism and suggestions as the aim has been to give all facts available and to draw conclusions based on present knowledge, which in many places is incomplete owing to the lack of bore holes and other data.

Four maps accompany the Report in a separate atlas. Maps I and II show the topography and geology, respectively, of Barbour County, and Maps III and IV show the same features for Upshur and the portion of Randolph studied.

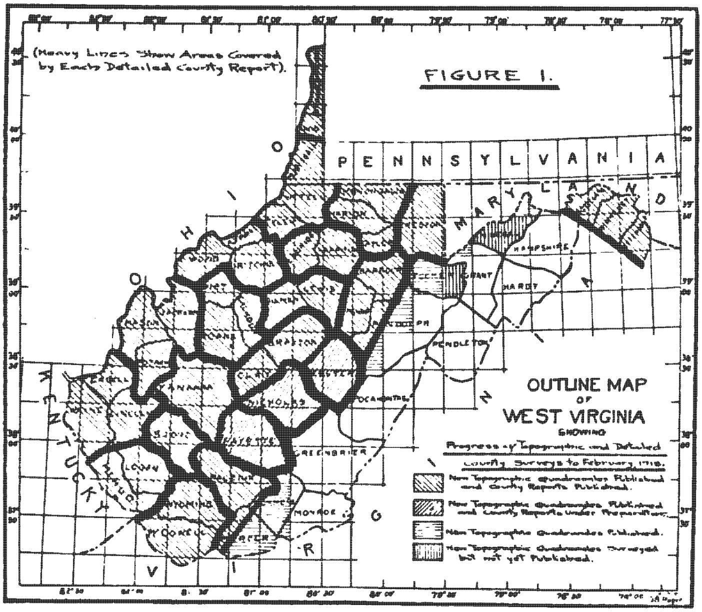
(Heavy Lines Show Areas Covered by Each Detailed County Report).
FIGURE 1.
OUTLINE MAP OF WEST VIRGINIA SHOWING
Progress of Topographic and Detailed County Surveys to February 1918.
New Topographic Quadrangles Published and County Reports Published.
New Topographic Quadrangles Published and County Reports under Preparation.
New Topographic Quadrangles Published.
New Topographic Quadrangles Surveyed but not yet Published.
PENNSYLVANIA
MARYLAND
OHIO
KENTUCKY
VIRGINIA
WOOD
RITCHIE
WIRT
MASON
JACKSON
ROANE
BRAXTON
CABELL
KANAWHA
CLAY
WEBSTER
NICHOLAS
BOONE
FAYETTE
GREENBRIER
LOGAN
RALEIGH
WYOMING
MONROE
McDOWELL
MERCER
TUCKER
GRANT
HARDY
HAMPSHIRE
RANDOLPH
PENDLETON
POCAHONTAS
PRESTON
BARBOUR

Figure 1.—Showing Progress of Topographic and Geologic Mapping in West Virginia.

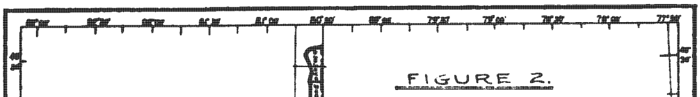

Figure 2.—Showing Location of Barbour, Upshur, and Western Portion of Randolph Area.

The geologic maps give not only the outcrops of the various series and minable coals but also show by number the exact location of all tests for oil and gas, coal test borings, and coal openings 1 to 1088, inclusive, numbered and described in the text. Besides these separate maps 22 figures appear in the text, and 18 in the introductory matter, of which Nos. 4 to 20, inclusive, are intended to show at a glance where the several coal seams are of minable thickness and purity. Since these coals are too thin or impure to be minable in certain regions, it has been necessary to show approximate lines of disappearance, in referring to which it must be remembered that there are probably small areas of good coal on the barren side and corresponding areas where the coal is worthless on the side where coal is shown. In some instances where the coals are known to be patchy over a considerable area, this feature is shown by breaks in the line shading. Wherever possible, detailed information should be secured from openings or borings published in the text.

The author, in company with Field Assistant D. D. Teets, Jr., spent the field season of 1915 making the necessary researches for this volume, being wholly responsible for the data contained in Parts I, II, and III. The original assignment included only Barbour and Upshur Counties, and great care was taken to make the investigations as complete as possible. The fact that Upshur is the native county of both Mr. Teets and the writer was of decided advantage not only because much previous knowledge of both counties was already available but also because numerous relatives and personal friends responded most heartily to all requests for information and local guidance. To all of these special acknowledgment is made both personally and in the name of the State whose interest was served.

Field work in the western portion of Randolph, which includes one of the most mountainous and sparsely settled regions of the State, was begun late in the fall of 1915 and an attempt was made to finish it the same season, but after the snow had reached a depth of nearly two feet, causing much personal hardship as well as obscuring most of the outcrops, work was finally abandoned for the winter and was concluded in the early spring of 1916. Owing to the conditions above, many details doubtless escaped attention that would otherwise have been noted, but fortunately the Campbell Creek (No. 2 Gas) and Sewell Coals could be followed with sufficient ease to trace the structure with certainty.

Mr. Teets, whose connection with the Survey ended early in the summer of 1916 on account of lack of State funds, assisted not only in the field work but also did most of the drafting and a considerable portion of the clerical work of the Report, all of which was performed in his usual careful and efficient manner.

Part IV, treating of the Paleontology, is the work of Dr. Wm. Armstrong Price, Paleontologist, most of the collections having been made by Mr. Teets and the writer while engaged in the general field work.

The chemical analyses and calorific tests, except a few taken from former Reports of the Survey, and a few others secured from private laboratories, were made by J. B. Krak and Wm. Lloyd Linton, Assistant Chemists, working under the direction and with the assistance of B. H. Hite, Chief Chemist.

Special acknowledgment is here made of the hearty manner in which many oil, gas, and coal companies and independent operators cooperated in furnishing valuable well records, secured at private expense, without the inclusion of which this volume would be incomplete. Credit for all such material furnished is given in the text.

Finally, the author expresses his obligation to Dr. I. C. White, State Geologist, whose constant supervision and valuable suggestions have added greatly to the value of this Report, and to R. C. Tucker of the Survey Staff for valuable clerical assistance in the preparation of the maps, figures, and manuscript, as also for reading and correcting the proof of this volume, and preparing the Appendix and Index.

DAVID B. REGER.

Morgantown, W. Va., May 19, 1917.

INTRODUCTION.

DISCUSSION OF THE RECORDS OF SOME VERY DEEP WELLS IN THE APPALACHIAN OIL FIELDS OF PENNSYLVANIA, OHIO, AND WEST VIRGINIA,

By

I. C. WHITE, State Geologist,

With

TEMPERATURE MEASUREMENTS

By

C. E. VAN ORSTRAND.

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R. A. GEARY NO. 770 WELL RECORD.

Previous Publication.

At the annual meeting of the Geological Society of America December 30th, 1912, the writer presented a "Note on a Very Deep Well near McDonald, Pennsylvania", and the same was published in Volume XXIV, pages 275 to 282, under date of June 10th, 1913. At that time the well in question, which is located on the R. A. Geary farm, about 5 miles northwest from McDonald, Pennsylvania, near the line between Allegheny and Washington Counties, had attained a depth of 6299 feet, and was still drilling. As related in the former "Note", the boring was executed by the Peoples Natural Gas Company, of Pittsburgh, Pennsylvania, an organization along with the Hope Natural Gas Company and the Carter Oil Company which the Supreme Court permitted the Standard Oil Company of New Jersey to retain in the order for its dissolution. Mr. John G. Pew of Pittsburgh is President of the Peoples Natural Gas Company and Capt. L. F. Barger of the same city was General Manager and in immediate charge of field operations during the period in which the Geary well was drilled, and to their courtesy and liberal views in their attitude toward geologic science, we are indebted for the record of this very deep boring.

As stated in the previous publication, this well is located on the Candor Dome described in the Burgettstown Folio of the U. S. Geological Survey by E. W. Shaw and M. J. Munn, a structural feature in the rocks of the region where the several sands of the lower Pennsylvanian, Mississippian, and upper Devonian beds had produced large quantities of natural gas, but in the course of 20-odd years of production had become practically exhausted on account of the great decline in rock pressures through continued use of the gas. It was in hopes of developing still deeper and virgin horizons of natural gas that the drilling of the Geary well was undertaken on the summit of the Candor Dome where several successive gas sands had already furnished large quantities of this matchless fuel.

After overcoming many difficulties, including the loss of a bailer and many hundred feet of steel line in the hole, pulling casing and reaming, to shut off additional water found at 6520 feet, as also the loss of two strings of drilling tools, only one of which could be recovered from a depth of nearly 7000 feet, the lower string of tools was left at the side of the hole which was drilled past them and the tools cased off with 7214 feet of 4½-inch casing welded into one continuous tube by the oxy-acetylene flame, and constituting probably the longest string of casing ever set in any boring anywhere in the world. After the salt water struck at 6520 to 6530 feet had been successfully shut off at 7214 feet and the missing set of tools safely side-tracked into the wall of the well, the lower joints of this very long casing tube under a water pressure of nearly 3000 pounds to the square inch collapsed around the drilling tools, and as there was of course a curve in the bore hole opposite the lost tools, the drilling set could not be withdrawn, and thus the second deepest hole ever yet sunk in the new world (and exceeded only by the Czuchow well—7349 feet—in the old world) was plugged beyond hope of recovery at a depth of 7248 feet, in the Summer of 1917, after more than 6 years of continuous work, and the expenditure of very many thousands of dollars in an effort to reach the "Clinton" oil and gas zone of Ohio which has proved gas-bearing and petroliferous practically from the Ohio River in Scioto County northward to Lake Erie in Cuyahoga County. This gas horizon was termed "Clinton" by Dr. Edward Orton, Sr., when it was first discovered, and it will probably continue to retain the original name, but the writer has always regarded it as more probably the equivalent of the White Medina Sandstone horizon immediately below the true Clinton of the New York Series, and in this conclusion Prof. J. A. Bownocker, the present State Geologist of Ohio, concurs.

The record of this second deepest well in America and third deepest in the world affords so much of geologic and stratigraphic interest that it is here given in full with the kind permission of Messrs. Pew and Barger. It reads as follows:

R. A. Geary Well Record, No. 770 of the Peoples Natural Gas Company.

Located 5 miles northwest from McDonald, Pennsylvania; beginning 130 feet below the crop of the Pittsburgh Coal; well mouth approximately 1050 feet above tide.

	Thickness. Feet.	Total. Feet.
Conductor	16	16
Unrecorded (13" casing set at 232')	434	450
Lime	20	470
Slate	125	595
Middle Kittanning Coal (water at 600')	5	600
Unrecorded	134	734
Salt Sand (gas at 760' and 912')	216	950
Pencil Cave (10" casing set at 953')	3	953
Big Lime	29	982
Big Injun Sand (gas at 1052')	259	1241
Unrecorded	137	1378
Squaw Sand (gas at 1379')	14	1392
Unrecorded	218	1610
Sand (Berea)	12	1622
Unrecorded	172	1794
Hundred-Foot Sand (gas at 1797')	23	1817
Unrecorded	93	1910
Thirty-Foot Sand (gas at 1912')	15	1925
Unrecorded	43	1968
Gordon Stray Sand (8¼" casing set at 1969')	3	1971
White slate	1019	2990
Lime	220	3210
White slate	230	3440
Lime	10	3450

				Thickness. Feet.	Total. Feet.
White slate				650	4100
Sand and lime (Benson, Bradford?)				70	4170
White slate				350	4520
Black slate				30	4550
White slate				650	5200
Black slate				120	5320
Black shale				200	5520
White slate				140	5660
Limestone		20'	Selinsgrove?	128	5788
Black lime		108			
Black slate (Marcellus)				220	6008
Black lime		15'	Corniferous	37	6045
Flint		22			
Gray sand (6⅝" casing, 6053') (water and gas, 6045')		155'	Oriskany	270	6315
Brown sand		60			
White sand (water, 6260-6265')		10			
Brown sand		45			
Black lime	80'	200'	Helderberg	385	6700
Sand and black flint	10				
Black lime	110				
White sand, Stormville Conglomerate (Coeymans) (gas,, 6522'; water, 6520 to 6530 feet)		15			
Black limestone	80'	170			
Gray limestone (Bossardville)	90				
Rock salt		8'	Salina Salt Series	340	7040
Lime and sand		67			
Rock salt		10			
Limestone		45			
Rock salt		10			
Lime and sand		20			
Rock salt		5			
Limestone		5			
Rock salt		5			
Limestone		20			
Rock salt		5			
Limestone (tools lost)		25			
Limestone and sand		95			
Salt and lime shells		20			
Sand and lime, Salina and Niagara, to bottom				208	7248

Casing Record:

16" hole to 232'; cased to that point with 13" casing;
13" hole to 953'; to that point 10" casing;
10" hole to 1969'; 8¼" casing to that point;
8¼" hole to 6053'; 6⅝" casing to that point, weight 68 tons;
6⅝" hole to 6315'; 4½" casing to that point, weight 46 tons;
Then pulled 4½" casing and reamed, and drilled hole to 7214' when 7214 feet of 4½" welded casing was set.

This detailed record may be summarized as follows, beginning at the base of the Pittsburgh Coal 130 feet above the derrick floor:

			Thickness. Feet.	Total. Feet.
Conemaugh Series	580′	Pennsylvanian	1080	1080
Allegheny Series	284			
Pottsville Series	216			
Mauch Chunk	3′	Mississippian	672	1752
Big Lime ("Mountain, Greenbrier")	29			
"Big Injun," "Squaw," and "Berea" Sands	640			
Catskill, (including Venango Oil Sand Group), Chemung, Portage, Hamilton, and Marcellus beds			4386	6138
Corniferous Limestone			37	6175
Oriskany Sandstone			270	6445
Helderberg			385	6830
Salina Salt Series			340	7170
Salina Shales and Niagara (Clinton?)			208	7378

It is regrettable that this boring could not have been sunk a few hundred feet deeper, since the horizon of the "Clinton" oil and gas zone could not have been more than 100 to 300 feet below where the tools were so successfully imprisoned, and reluctantly abandoned by Mr. Pew and his associates.

The demonstration of the existence of commercial deposits of rock salt in the Salina Series extending in unbroken sheets from Cleveland past Akron (where its presence had already been demonstrated) to the vicinity of Pittsburgh and probably many miles southward, is an accomplishment well worth all of the cost of the boring, to say nothing of the great addition to the sum of stratigraphic and geologic knowledge otherwise forever to remain a sealed book except for the labor and money expended thereon by the men of broad vision and ample means who had at their command the unlimited resources of the Standard Oil Company of New Jersey. To Mr. A. C. Bedford, Chairman, and the other officers of this great corporation, geologic science is indebted for this rich contribution to the sum of human knowledge. It is barely possible that in addition to the vast quantity of common salt, or sodium chloride, in these great underground deposits, some of the potash salts, potassium chloride and potassium sulphate, may also exist and will be found interbedded among these other saline products.

Opportunity was afforded the experts of the U. S. Geological Survey to test this deep well for temperature observations and the Peoples Natural Gas Company also made some temperature tests on its own account, these latter being given in the Geological Society of America publication referred to above.

The temperature measurements of C. E. Van Orstrand, Physical Geologist of the U. S. Geological Survey, have been courteously submitted by him to the writer by the kind permission of the Director of the U. S. Geological Survey, for publication in connection herewith, and they will be given later in this Report in connection with other deep well temperatures.

Mr. Van Orstrand, with improved temperature reading and recording devices, was to have been given an opportunity to make other temperature tests before the boring was abandoned, but the unhappy accident mentioned above prevented this very desirable accomplishment.

The water found at 6,260 feet rose in the hole to a height of 5560 feet, or to 700 feet below the top of the well. Its chemical composition is as follows, according to an analysis of a sample made by the Pittsburgh Testing Laboratory—H. H. Craver, Chief Chemist:

Specific gravity at 60° Fahrenheit	1.1085
Oil	Trace
	Parts per 100,000
Alkalinity as calcium carbonate	5.50
Calcium chloride	4,421.40
Magnesium chloride	251.60
Sodium chloride	5,018.20
Sulphuric anhydride	Trace
Iron oxide	Trace
Sediment (rock powder)	224.60
Total solids	9,921.30
Total solids exclusive of pulverized rock sediment	9,696.70

This analysis looks as though we had here a case of fossil ocean water imprisoned since mid-Paleozoic time.

DERRICK CITY DEEP WELL, 4 MILES EAST OF BRADFORD, PENNSYLVANIA.

Although the Geary well failed to penetrate to the "Clinton" (Medina) oil and gas horizon of Ohio, another deep boring about 140 miles northeast from the Geary location did reach and pass below that horizon. This well was drilled by the United Natural Gas Company of Oil City, Pennsylvania. It is located near Derrick City, 4 miles east from Bradford, in McKean County, Pennsylvania, and the record of the boring, as transmitted through Capt. L. F. Barger by Mr. W. P. Craig, of Oil City, Superintendent of the United Natural Gas Company, is as follows:

Record of Derrick City Deep Well.

Four miles east of Bradford, Pennsylvania, as given by W. P. Craig, Superintendent, United Natural Gas Company; mouth of well about 1585 feet above tide, and 815 feet below the Olean Conglomerate, the basal member of the Pennsylvanian.

		Thickness. Feet.	Total. Feet.
Unrecorded		1120	1120
Sand, Bradford		78	1198
Interval, unrecorded		32	1230
Slate, light, soft		90	1320
Slate, black, soft		95	1415
Slate, black, soft		15	1430
Slate, light, soft		37	1467
Sand, gray, hard..........12′ Slate .... 1 Sand, gray, hard..........10	Kane Sand	23	1490
Shale, dark, soft		60	1550
Sand shells, dark, hard		20	1570
Shale, light, soft		54	1624
Slate, light, soft		16	1640
Sand shell, dark, hard		10	1650
Shale, dark, soft		30	1680
Sand shells, dark, hard		40	1720
Slate, light, soft		10	1730
Shale, brown, soft		10	1740
Sand shell, brown, hard		10	1750
Lime shells, light, hard		50	1800
Slate, light, soft		30	1830
Slate, white, soft		40	1870
Shale, brown, soft		30	1900
Slate and lime shell, light, hard		50	1950
Slate and lime shell, light, hard		40	1990
Slate and lime shell, brown, hard		40	2030
Slate and lime shell, light, hard		20	2050

		Thickness. Feet.	Total. Feet.
Slate and lime shell, light, hard		20	2070
Slate and lime shell, dark, hard		30	2100
Lime, light, hard		20	2120
Lime, light, very hard		30	2150
Slate and lime, light, medium		20	2170
Slate and lime, light, medium		30	2200
Slate and lime, dark, medium		30	2230
Slate, light, soft		35	2265
Slate and shells, light, medium		35	2300
Lime and slate, light, hard		43	2343
Slate, light, soft		32	2375
Slate, light, soft		25	2400
Shells, dark, hard		30	2430
Shells, dark, hard		16	2446
Shells and slate, light, hard		24	2470
Shale, brown, soft		20	2490
Sand shells, brown, hard		25	2515
Slate, dark, soft		25	2540
Slate, black, soft		90	2630
Shale, brown, soft		30	2660
Slate shells, light, medium		25	2685
Slate, black, soft		43	2728
Sand shells, black, hard		22	2750
Slate shells, brown, soft		50	2800
Shale, brown, soft		33	2833
Sand shells, brown, hard		12	2845
Shale, brown, soft		155	3000
Slate, black, soft		100	3100
Slate, white, soft		50	3150
Slate, black, soft		66	3216
Slate, black, soft		184	3400
Shale, black-brown, soft		20	3420
Sand, shell, black-brown, soft		155	3575
Slate shale, black, soft		45	3620
Shale, black, soft		30	3650
Shale, brown, soft		19	3669
Pencil Cave, black (caved very badly; dumped water with bailer)...31′ Shale, black, soft........80 Shale, brown, soft........20 Lime shells, dark, hard...30 Shale, brown, soft........70 Shale, black, soft........165	Marcellus	396	4065
Sand, black, hard, pebbly (gas showing)........30′ Lime, black, hard........20 Flint, dark, very hard.... 5 Flint, light, very hard....15	Corniferous	70	4135

			Thickness. Feet.	Total. Feet.
Sand, white, very hard, Oriskany (showing of oil)			20	4155
Lime, dark, very hard	10′	Helderberg	335	4490
Sandy lime, light, very hard	10			
Lime, dark, very hard	25			
Lime, light, very hard	15			
Sandy lime, dark, very hard	10			
Sandy lime, (Coeymans, Stormville) dark, very hard (pocket of gas from 4225′ to 4235′)	10			
Lime, dark, very hard	30			
Brick shale, dark, soft (sample lost)	5			
Lime and gypsum, medium, (sample lost)	10			
Lime, dark, hard	20			
Lime, dark, hard	30			
Lime, dark, hard	20			
Lime, dark, hard	20			
Lime, dark, hard	30			
Lime, dark, hard	20			
Lime, light, hard	20			
Lime, dark, hard	15			
Lime, light-brown, hard	10			
Lime, light, hard	15			
Lime, dark, hard	10			
Pure salt, white, soft	30′	Salina Salt Group	223	4713
Sandy lime, white, fairly soft, (showing of black oil)	15			
Lime and slate, white, fairly soft	5			
Lime, dark, very hard	25			
Lime, brown, hard	31			
Salt, white, soft (caving considerably)	10			
Lime, brown, hard	20			
Lime, gray, very hard	12			
Salt, white, soft	47			
Lime, brown, hard	8			
Salt and "lava,"* white, soft	20			

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*Most probably "lava" means anhydrite or sulphate of lime, a common mineral interstratified with salt beds.

			Thickness. Feet.	Total. Feet.
Slate "lava," gray, soft (caved very badly from 4723' to 4780'. Cemented this cave with good results, using 5 tons of cement and sand)	20'	Salina Shales	297	5010
Slate-"lava," gray, soft	47			
Slate-"lava," gray, soft (bad cave 4785' to 4840'; did not cement this cave)	60			
Slate, white, soft, (not caving)	20			
Slate shells, dark, hard (standing up nicely)	40			
Lime shells, dark, hard	30			
Lime, dark, hard	15			
Slate shells, dark, fair drilling	5			
Slate, light and dark, soft (caving slightly)	15			
Shale, dark-brown, soft (not caving)	45			
Lime, dark-gray, very hard	10'	Niagara	145	5155
Lime, dark-gray, very hard	10			
Lime, dark, very hard	20			
Lime, gray, hard	25			
Lime and shells, black, (fair drilling)	10			
Lime, black, hard	15			
Lime, gray, hard	10			
Lime, black, very hard	40			
Lime, gray, very hard	5			
Shale, black, (fair drilling)	15'	Clinton Shales	165	5320
Sand, gray, very hard	15			
Lime, black, very hard	15			
Sand, gray, very hard (small show of oil)	46			
Lime, dark, hard	4			
Lime, brown, hard	10			
Lime, dark, hard	10			
Lime, brown, hard	10			
Lime, gray, hard	20			
Lime, dark-gray, hard	20			

			Thickness. Feet.	Total. Feet.
Sand, light-gray, hard	15'	White Medina ("Clinton Sand")	240	5560
Sand, dark-gray, hard	2			
Sand, light-gray, hard	3			
Sand, light-gray, hard	2			
Sand, dark, soft	3			
Sand, dark, shells	5			
Shells, dark, fair	4			
Sand, gray, hard	6			
Sand, dark, soft	20			
Sand, dark, soft	5			
Shale, dark, soft	15			
Shale, dark, fair	10			
Shale, dark, fair	10			
Shale, blue, soft	20			
Shale, black, soft	20			
Sand, dark-gray, hard	35			
Slate, light-gray, soft (caved considerably)	35			
Slate, gray, soft	20			
Sand, gray, hard	10			
Sand, red, hard	3'	Red Medina	82	5642
Sand, red, hard	2			
Sand, red, hard	5			
Sand, red, hard	2			
Sand, red, hard, (some white shells)	2			
Sand, red, hard (softened up slightly)	4			
Sand, red, hard	2			
Sand, red, hard	5			
Sand, red, hard, (more white shells)	5			
Sand, red, hard	5			
Sand, red, hard	5			
Sand, red, softer (shells and broken sand)	5			
Sand, gray, softer (red predominating)	5			
Sand, gray, very hard (white predominating)	5			
Sand, gray, very hard (white predominating)	7			
Sand, red, softer (pure red)	3			
Sand, red, hard, (pure red)	11			
Sand, red, hard (gray predominating)	4			
Sand, red, softer, sand coarse and shelly	2			

			Thickness. Feet.	Total. Feet.
Sand, gray, hard, almost white	2′	Gray or Lower Medina	118	5760
Sand, light-gray, hard	2			
Sand, white, hard	2			
Sand, white, hard	2			
Sand, gray, hard (slightly sprinkled red)	5			
Sand, gray, hard	2			
Sand, dark-gray, hard	2			
Sand, light-gray, hard	16			
Sand	5			
Sand, very dark, very hard	4			
Sand, light-gray, softer	4			
Sand, dark-gray, very hard	4			
Sand, light-gray, very hard	3			
Sand, dark-gray, very hard (hardest stratum found)	5			
Brown sand shale, softer, fair drilling	10			
Red sand and coarse, hard shells to bottom, where well was abandoned February 2, 1914	50			

This detailed record may be summarized as follows, beginning with the missing intervals up to the Pittsburgh Coal horizon, approximately 1900 feet above the top of the boring:

				Thickness.	Depth Below Pittsburgh Coal.
Pittsburgh Coal				...	....
Pennsylvanian	Conemaugh	600′		1100	1100
	Allegheny	250			
	Pottsville	250			
Mississippian, estimated to base of Berea Sand horizon				530	1630
Catskill and Chemung Oil Sand Groups, to bottom of Kane Sand		1775′		4350	5980
Chemung, Portage, Hamilton, and Marcellus		2575			
Corniferous	Sand, dark, hard, pebbly	30′	70′	1090	7070
	Limestone	20			
	Flint	20			
Oriskany Sandstone			20		
Helderberg			335		
Salina (Salt Zone)			223		
Salina Shales			297		
Niagara Limestone			145		
Clinton Shales, Sandstones, and Limestones				165	7235
Medina White Sandstones ("Clinton" Oil Sand of Ohio)				240	7475
Medina Red Sandstones and Shales				82	7557
Medina Gray Sandstones, to bottom				118	7675

No temperature observations were made in this well so far as known to the writer.

The top of the White Medina, struck at 5320 feet, and 1255 feet below the top of the Corniferous Limestone, most probably correlates with the "Clinton Oil Sand" horizon of Ohio, although it is barely possible that the 46 feet of gray sand with "showing of oil" 74 feet higher might represent that petroliferous level.

The estimate of 1100 feet at Derrick City from the base of the Olean Conglomerate up to the Pittsburgh Coal horizon is only approximately correct, since it may be 100 feet in error, but the average interval from the coal in question to the base of the Pottsville in the Pittsburgh region has been used in this estimate, while the interval of 815 feet from the mouth of the well to the base of the Olean Conglomerate (Pennsylvanian) is that furnished by Mr. W. P. Craig, who had it specially determined, presumably by aneroid measurement.

The interval from the Pittsburgh Coal horizon to the base of the famous Bradford Sand would be at Bradford according to these figures approximately only 3113 feet, and 3405 feet to the base of the Kane Sand, since in northern Pennsylvania the upper portion of the Mississippian suffered much from erosion before the Olean Conglomerate (the beginning of the Pennsylvanian deposits) was laid down. The proof of this is attested by the fact that the Olean Conglomerate contains many Mississippian fossils as pebbles while the conglomerate itself rests unconformably upon the remnants of the Pocono Shales and Sandstones, the Mauch Chunk Shale and the underlying Mountain or Greenbrier Limestone having been entirely eroded before the deposition of the Olean Conglomerate. Hence in figuring the thickness of the Devonian Shales at the Derrick City well the amount of Mississippian sediments has been assumed as 530 feet down to the base of the Berea Grit horizon, which corresponds closely with that (509′) found for these beds in the Bradys Bend well.

This erosion extended southward practically to the latitude of Pittsburgh as we learn from other drill hole records, but beyond there to the south, the Mauch Chunk Red Shale and the Mountain Limestone both make their appearance in the section.

In order to show the thickening of the Upper Devonian beds southward, the record of a boring from Bradys Bend on the Allegheny River, about 85 miles southwest from Bradford, is here given on the authority of Emmet Queen, the oil and gas operator, of Pittsburgh, Pa., as follows:

RECORD OF BRADYS BEND WELL.

	Thickness. Feet.	Total. Feet.
Interval above top of well to Pittsburgh Coal horizon (estimated by I. C. W.)	815	815
Conductor and unrecorded	35	850
Ferriferous (Vanport) Limestone	20	870
Fire clay	15	885
Coal, Clarion	4	889
Slate and shale	156	1045
Mountain Sand (Pottsville and Big Injun)	243	1288
Slate and shale	162	1450
Sand, "Squaw"	38	1488
Slate and shale	185	1673
"Gas Sand" (Berea)	24	1697
Slate and shale	102	1799
"Hundred-Foot" Sand (Gantz and 50-Foot)	84	1883
Slate and shale	57	1940
"Thirty-Foot" Sand	30	1970
Slate and shale	105	2075
"Third"' or Gordon Sand	20	2095
Slate	10	2105
"Boulder" Sand	10	2115
Slate and shale	40	2155
Fourth Sand	17	2172
Slate and shale (No Fifth nor Bayard Sands)	503	2675
Beatty Sand (Warren or Tiona)	25	2700
Slate and shale	335	3035
"Speechley" Sand, top 15 feet gray and full of pebbles (gas)	60	3095
Slate and shale	1020	4115
"Bradford" Sand, (possibly "Kane") top 15 feet pebbly, the balance "honeycomb," brownish and showing dark oil	80	4195
Slate and red ? rock to bottom	137	4332

This record reveals a thickening of approximately (4115—3035) 1080 feet between the Pittsburgh Coal horizon and the Bradford Sand in the 85 miles between Bradford and Bradys Bend, unless the Sand identified here as "Bradford" should really represent the "Kane", which would appear probable with the Bradford absent, since the usual interval between the Speechley and Bradford Sands is only 600-700′ and not 1020′ as given in this record, and which would be about the correct interval from the "Speechley" to the "Kane".

This Bradys Bend record is quite important, since it reveals most of the Appalachian field oil and gas sands in a vertical range, and exhibits their stratigraphic relationships to the famous Pittsburgh Coal, whose horizon belongs at an approximate interval of 850 feet above the Vanport Limestone. It is quite probable that the "red rock" noted in the last 137 feet of the boring had fallen into the hole from the caving walls of the well much higher up since other deep borings find no "reds" below the "Elizabeth" Sand.

AKRON, OHIO, DEEP WELL.

This Bradys Bend well penetrated only through the upper portion of the Devonian Shales, but a boring near Akron, Ohio, approximately 100 miles nearly due west from Bradys Bend, starting near the base of the Pottsville Series, was drilled below the "Clinton" (Medina) Sand. The record of this well furnished by Capt. L. F. Barger, of the Peoples Natural Gas Company, and not heretofore published, reads as follows:

Record of Seiberling Well.

Located south of Akron, Ohio; began, May 12th, 1905; completed, August 1st, 1905; authority, Capt. L. F. Barger, General Superintendent, Peoples Natural Gas Company, Pittsburgh, Pennsylvania.

	Thickness. Feet.	Total. Feet.
Drive pipe (10″) (Glacial Drift)	139	139
Unrecorded	161	300
Berea Grit	85	385
Shales, Devonian (8¼″ casing at 455′)	1775	2160
Hard limestone, (Corniferous, Oriskany, Helderbery, &c)	640	2800

			Thickness. Feet.	Total. Feet.
Rock salt	14′	Salina Salt Series. (Thickness of rock salt 304′)	420	3220
Limestone	16			
Rock salt	40			
Limestone	10			
Rock salt	38			
Limestone	15			
Rock salt	45			
Limestone	5			
Rock salt	32			
Limestone	30			
Rock salt	40			
Limestone	5			
Rock salt	40			
Limestone	25			
Rock salt	30			
Limestone	10			
Rock salt	25			
Limestone			20	3240
Slate			40	3280
Limestone, Niagara and Clinton			321	3601
Sand, "Clinton" (Medina), (little oil, gas, and water)			5	3606
Limestone			143	3749
Slaty limestone to bottom			40	3789

The enormous thickness of **Rock Salt** (304′) found in the Akron boring, compared to about 100 feet in the Derrick City well, and 60 feet in the R. A. Geary deep boring, shows that the vicinity of Akron was probably near the center of the ancient sea which becoming isolated from oceanic waters by crustal movement gave origin through evaporation of its saline waters to these extensive salt deposits. These we now know extended from the vicinity of Pittsburgh, Pennsylvania, northward beyond Cleveland under Lake Erie and far northward into Canada, and central Michigan, a distance of 300 to 400 miles, thus covering an area of many thousand square miles and constituting an inexhaustible supply of saline minerals, since a thickness of 550 and 600 feet of rock salt is reported from the Dearborn and Royal Oak wells, respectively, in 870 and 932 feet of Salina Beds, near Detroit, Wayne County, Michigan, according to R. C. Allen, State Geologist.*

The thickness (1775′) of the Upper Devonian Shales in the Seiberling boring is so much less than in the Derrick City well (4350′) that it reveals a very rapid westward thinning of these particular measures. As a gauge on this westward thinning or eastward thickening, as the case may be, we fortunately have access to another measurement of these Upper Devonian Shales, near West Middlesex, Mercer County. Pennsylvania, about 5 miles south from Sharon, and about 55 miles nearly due east from Akron. Here the No. 2 well of the Wheatland Iron Company found the bottom of the Berea Grit at 351 feet, and the top of the Corniferous Limestone at 3377 feet, thus giving a thickness of 3026 feet for the Devonian Shales at that locality which represents (3026—1775=1245′) an eastward thickening or a westward thinning of 22.63 feet per mile in the 55 miles between Akron and West Middlesex, and if the same rate were continued eastward 45 miles farther to the latitude of Bradys Bend, would make an additional increase of 1018 feet, and thus give these Upper Devonian Shales an approximate thickness of 4044 feet in the Bradys Bend well. Hence, the top of the Corniferous Limestone in that boring would lie about 1400 feet below the bottom of the same and would have required a well of nearly (4917′) 5000 feet in depth to penetrate to the base of these Upper Devonian Shales at Bradys Bend.

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*Publication 24, Series 20, 1916, p. 247, Michigan Geol. and Biol. Survey.

The Peoples Natural Gas Company and others have developed a deep sand gas field in the Bradford and higher sand horizons in Westmoreland County, Pennsylvania. Since none of these deep well records has yet been published, and as they furnish most interesting data for correlation purposes, two of them are here given through the courtesy of Mr. John G. Pew, President of the Peoples Natural Gas Company, of Pittsburgh, Pennsylvania. The first one is Well No. 1099 of the Peoples Natural Gas Company's series, and is located on the land of John Hamilton Heirs, Franklin Township, Westmoreland County, Pennsylvania. Its record reads as follows:

JOHN HAMILTON HEIRS WELL NO. 1099.

Located in Franklin Township, Westmoreland County, Pa.; drilling commenced February 3, 1916; completed, April 20, 1916; Contractor, Geo. M. Evans.

	Top. Feet.	Bottom. Feet.
Slate and shells	0	265
Coal, Upper Freeport	265	273
Lime, Upper Freeport	273	290
Slate	290	615
Sand } Pottsville	615	650
Slate } Pottsville	650	700
Sand } Pottsville	700	755
Slate	755	830
Sand, Big Injun	830	1230
Slate	1230	1510
Sand, Murrysville	1510	1585
Slate	1585	1590
Sand, "Hundred-Foot"	1590	1700
Slate and shells	1700	2010
Sand	2010	2030
Slate and shells	2030	2070
Sand, Fifth	2070	2120
Slate and shells	2120	2826
Sand, Speechley (gas, 2826′, steel-line measurement, 6/10″ water in 2″ opening, included in open flow given for Bradford Sand)	2826	2840
Slate	2840	2865
Sand	2865	2885
Sand, Tiona	2885	2930
Slate	2930	3000
Sand, Sheffield	3000	3012
Slate and shells	3012	3426
Sand, Bradford	3426	3446
Slate and shells	3446	3505
Sand, Bradford (gas, 3515′, steel-line measurement, 1-6/10″ water in 3″ opening, 428,110 cubic feet daily)	3505	3535
Slate, to bottom (steel-line measurement)	3535	3541

Casing Record: 12½″, 19′ 7″; 10″, 100′ 3″; 8¼″, 801′ 11″; 6⅝″, 1721′ 0″; 4″, 2107′ 4″. 12½″ casing used to shut off loose sand. 10″ casing used to shut off surface water. 4″ tubing used on account of high rock pressure.

Well shot April 21, 1916, with 40 quarts. Top of shell, 3515′; bottom of shell, 3525′; length, 10′; diameter, 5 inches. Shot in Bradford Sand by West Penn Torpedo Company. Open flow test before shooting, 1-3/10″ water in 3″ opening.

Minute Pressure Taken in 4″ Tubing:

1	2	3	4	5	6	7	8	9	10	30	60	4 hrs.
10	18	22	28	30	32	36	40	44	48	112	220	540

The record of another deep sand well drilled by the Peoples Natural Gas Company in Westmoreland County, Pennsylvania, is as follows:

W. F. AND R. N. CROOKS WELL NO. 1212

Located in Upper Burrell Township, Westworeland County, Pennsylvania; drilling commenced January 12, 1917; completed, February 14, 1917; Contractor, Geo. M. Evans.

	Top. Feet.	Bottom. Feet.
Coal, (Upper Freeport)	320	
Lime	330	
Sand, 60′	725	780
Sand, 70′	820	
Sand, Big Injun	990	
Sand, Murrysville	1530	1640
Sand, 100-Foot (gas at 1701′, steel-line measurement, 1″ water in 6⅝″ casing)	1640	1770
Red rock	1780	1810
Slate and shell	1810	2060
Sand, Fifth	2060	2161
Slate and shell	2161	2871
Sand, "Stray" (probably top of Speechley—I. C. W.) (gas at 2873′, 12/10″ water in 2″ opening)	2871	2900
Slate and shell	2900	2956
Sand, Speechley	2956	2982
Slate and shell	2982	3265
Sand, Sheffield	3265	3280
Slate and shell	3280	3561
Sand, Bradford (little gas at 3563′)	3561	3579
Slate to bottom (steel-line measurement)	3579	3609

Minute Pressure in 6⅝″ tubing:

1	2	3	4	5	6	7	8	9	10	30	60	minutes.
0	0	2	5	8	11	13	15	17	19	41	80	pounds.

The Pittsburgh Coal horizon lies above the tops of both wells, but the coal found at 265 feet in well No. 1099 and at 320 feet in well No. 1212 appears to represent the Upper Freeport bed, which in this region belongs at 600 to 650 feet below the famous Pittsburgh seam. This correlation puts the bottom of the Bradford Sand in well No. 1099 at 3262 feet below the Upper Freeport Coal, while in well No. 1212, the same horizons are separated by a vertical interval of 3259 feet, or say 3900 feet, in round numbers, below the Pittsburgh Coal bed, while the interval below the top of the Big Injun Sand is 2675 feet in well No. 1099 where the top of the Big Injun is clearly defined.

DEEP DRILLING IN WEST VIRGINIA.

Quite recently the Hope Natural Gas Company and the Reserve Gas Company have inaugurated a deep drilling campaign in West Virginia, and have succeeded in finding a gas horizon furnishing wells of 300,000 to 1,000,000 cubic feet daily in what appears to be the representative of the "Bradford Sand" of Westmoreland County, Pennsylvania. This deep sand horizon, which was first developed on the farm of J. C. Benson in western Barbour County, found gas at a depth of 4090 feet, about 4300 feet below the horizon of the Pittsburgh Coal, and 2765 feet below the top of the Big Injun Sand. At this well the detailed record of which is given on pages 85-86 of this volume, a rock pressure of 1800 pounds to the square inch was recorded from this Benson Sand, and it is not certain that the total pressure was registered, owing to the considerable leakage from joints and couplings at such high pressures.

A boring made on the M. D. Reiley farm, 5 to 6 miles west from Philippi, Barbour County, by the Hope Natural Gas Company, gives an interesting record, and also reveals the presence of a gas-bearing sand at 327 feet above the Benson Sand horizon. This valuable record is here given through the courtesy of John G. Pew and J. B. Corrin, of Pittsburgh, Pennsylvania:

M. D. REILEY WELL NO. 5048.

Located 5 to 6 miles west from Philippi, Barbour County; drilled by the Hope Natural Gas Co.; commenced drilling, December 14, 1917; completed, April 4, 1918.

	Top. Feet.	Bottom. Feet.
Yellow clay	0	16
Red rock	16	30
Bluff Sand (2 bailers water per hour at 58′)	30	85
Coal	85	88
White slate	88	90
White lime	90	115
Red rock	115	125
Lime	125	135
Red rock	135	150
White slate	150	165
White lime	165	180

	Top. Feet.	Bottom. Feet.
White slate	180	210
Red rock	210	225
White slate	225	280
Dark lime	280	320
White slate	320	330
White lime	330	350
Sand (Big Dunkard) (water at 360′ (10″ casing at 371′)	350	385
Slate	385	391
Lime	391	430
Black slate	430	455
Dark lime	455	475
First Gas Sand	475	515
White slate	515	530
Gas Sand	530	550
Coal	550	553
Second Gas Sand	553	700
White slate	700	740
Black slate	740	780
First Salt Sand	780	790
Black slate	790	810
Coal	810	817
Second Salt Sand	817	885
Dark lime	885	920
Gritty lime	920	955
Third Salt Sand	955	990
Black slate	990	1080
Lime	1080	1150
Maxton Sand	1150	1180
Slate and shells	1180	1210
Red rock	1210	1285
Lime	1285	1312
Red rock	1312	1415
White slate	1415	1453
Little Lime	1453	1470
Pencil Cave	1470	1495
Big Lime	1495	1565
Big Injun Sand	1565	1590
Red rock	1590	1592
Big Injun Sand	1592	1690
White slate	1690	1697
Squaw Sand	1697	1707
Slate	1707	1725
Dark lime	1725	1820
Dark slate	1820	1823
Dark lime	1823	1833
Dark slate	1833	1843
Gantz Sand (gas at 1861′)	1843	1965
White slate	1965	1975
Lime	1975	1987
White slate	1987	2005
Fifty-Foot Sand	2005	2025
White slate	2025	2033
Thirty-Foot Sand	2033	2045
Red rock	2045	2052

	Top. Feet.	Bottom. Feet.
Dark lime	2052	2064
Slate and shells	2064	2100
Red rock	2100	2117
Dark slate	2117	2127
Sand	2127	2138
Red rock	2138	2315
Gordon Sand (oil show)	2315	2373
White slate	2373	2392
Fourth Sand	2392	2417
Red rock	2417	2425
White sand	2425	2437
Slate	2437	2463
Sand, Fifth (oil show, 2465′)	2463	2514
White slate	2514	2550
Lime	2550	2565
White slate	2565	2600
Lime	2600	2615
White slate	2615	2633
White lime	2633	2640
Slate	2640	2657
White sand	2657	2672
White slate	2672	2830
Lime	2950	2964
Slate and shells	2964	3105
Lime	3105	3140
Slate and shells	3140	3270
Lime	3270	3285
Slate and shells	3285	3307
Slate	3307	3340
Lime	3340	3350
Slate	3350	3370
Sand	3370	3375
Lime	3375	3396
White, hard lime	3396	3425
Hard lime	3425	3436
White slate	3436	3446
Hard lime	3446	3455
Dark slate	3455	3470
Hard lime	3470	3480
Lime shells	3480	3490
Slate and shells	3490	3525
Hard lime	3525	3545
Lime	3545	3550
Dark slate	3550	3565
Hard gritty lime	3565	3575
Dark slate	3575	3585
Hard gritty lime	3585	3600
Dark slate	3600	3625
Soft slate	3625	3645
Hard lime	3645	3660
Slate	3660	3690
Dark slate	3690	3700
Lime	3700	3740
Hard lime	3740	3775
Dark slate	3775	3793

	Top. Feet.	Bottom. Feet.
Soft lime	3793	3800
Dark, soft slate	3800	3820
Dark lime	3820	3860
Soft lime	3860	3900
Slate and shells	3900	3950
Hard lime	3950	3970
Soft sand	3970	3975
Gray slate	3975	4020
Soft lime	4020	4050
Slate and shells	4050	4077
Soft sand (gas, at 4077′; 10/10″ mercury through 2″ opening=552,000 cu. ft. daily)	4077	4079
Hard lime	4079	4100
Dark slate	4100	4125
Soft sand	4125	4135
Lime	4135	4170
Slate and shells	4170	4230
Hard lime	4230	4270
Shells	4270	4320
Slate and shells	4320	4355
Soft lime	4355	4390
Slate	4390	4403
Benson Sand (gas at 4404′, 50/10″ water through 2″ opening=336,000 cu. ft.)	4403	4409
Lime shells, to bottom	4409	4448

The presence of a gas horizon 327 feet above the Benson Sand in this well makes it possible that this upper sand may represent the **Bradford Sand** horizon, while the **Benson** might be the **Kane Sand** horizon, the lowest gas-bearing zone yet developed in the Devonian beds of northern Pennsylvania, since the Kane Sand, as shown by the record of the Derrick City well on a previous page, comes approximately 300 feet below the Bradford Sand. This Reiley well starts about 200 feet below the Pittsburgh Coal, and thus reveals a considerable thickening in the measures between this coal bed and the top of the Big Injun Sand due principally to the increase in the Mauch Chunk Red Beds, and the Pottsville Series immediately above, thus increasing considerably the interval between the Pittsburgh Coal and the Benson Sand. If this "Reiley" Sand at 327 feet above the "Benson" should finally prove to be at the "Bradford" Sand horizon, then the one called "Sheffield" in the Westmoreland County deep wells would most probably represent the "Bradford" Sand of Pennsylvania, while the one called "Bradford" in these records would most probably represent the "Kane" Sand of northern

Pennsylvania. This interpretation is held by James N. Pew, General Manager of the Peoples Natural Gas Company.

In addition to the deep sands shown in the Reiley well, the Hope Natural Gas Company has also found another deep gas horizon in the same general region not hitherto known to be productive in West Virginia. It comes at 1500 to 1600 feet below the top of the "Big Injun" Sand, near Good Hope, Harrison County, on the border of Lewis. The initial output was over a million cubic feet. This horizon would belong at about 3100 feet below the Pittsburgh Coal at the locality in question and would appear to represent either the Warren or Tiona Sand of western Pennsylvania which in the deep well drilled at Bradys Bend, Armstrong County, Pennsylvania, the record of which is given on page xxxix, lies about 1500 feet below the top of the Big Injun Sand, and 1000 feet below the top of the Berea Grit, or 2675 feet below the horizon of the Pittsburgh Coal.

The following record of the W. C. Burnside deep well, located in Grant District, near Good Hope, Harrison County, West Virginia, being well No. 2073 (5008) of the Hope Natural Gas Company, reveals the stratigraphic relations of this new deep sand horizon both to the Benson Sand below and to the other well-known sands above. It is given here through the courtesy of John B. Corrin and John G. Pew, Vice-Presidents of the Hope Company:

W. C. BURNSIDE NO. 2073 (5008) WELL RECORD.

	Top. Feet.	Bottom. Feet.
Little Dunkard Sand	280	320
Second Salt Sand	870	930
Little Lime	1172	1184
Pencil Cave	1184	1202
Big Lime (water, 1245′)	1202	1279
Big Injun Sand (gas, 1373′)	1279	1388
Fifty-Foot Sand (gas, 1725′)	1720	1758
Thirty-Foot Sand	1772	1797
Gordon Stray Sand	1997	2007
Gordon Sand	2010	2037
Fifth Sand (gas, 2143′)	2142	2160
Limestone	2651	2750
Slate	2750	2850
Sand, Burnside (Warren or Tiona) (gas, 2852′)	2850	2855

	Top. Feet.	Bottom. Feet.
Slate	2855	2983
Lime	2983	2997
Slate	2997	3520
Lime	3520	3540
Slate	3540	4205
Benson Sand	4205	4220
Slate (light) to bottom	4220	4515

6⅝" casing, 1279'; 5 3/16", 2172'; 2", 2797"; 3", 44' 8"; 3" Perf., 22' 6"; all left in well.

The K. M. Patton well No. 745 of the Reserve Gas Company, drilled a few hundred feet distant from the one on the Burnside farm reveals other sands not given in the latter and reads as follows, according to Messrs. Corrin and Pew:

K. M. PATTON WELL NO. 745 OF RESERVE GAS COMPANY.

	Top. Feet.	Bottom. Feet.
Little Dunkard Sand	550	585
Gas Sand	705	775
Maxton Sand	1170	1245
Shells	1245	1310
Big Lime	1340	1414
Big Injun Sand	1414	1535
Squaw Sand	1605	1635
Berea Sand	1725	1745
Gantz Sand	1760	1785
Fifty-Foot Sand	1865	1950
Thirty-Foot Sand (gas at 1980')	1975	1990
Gordon Stray Sand	2095	2110
Gordon Sand	2115	....
Fourth Sand		2180
Fifth Sand (gas at 2217')	2215	2227
Bayard Sand (gas at 2295')	2293	2300
Sand	2630	2645
Sand	2835	2910
Sand, Burnside (Warren or Tiona) (gas at 2989')	2987	2990
Unrecorded to bottom	2990	3011

Gas tests: 30', 5th, Bayard, 134,400 cu. ft.—255 lbs. rock pressure; Burnside, 304,320 cu. ft.,—1428 lbs. rock pressure.

This Patton record reveals the presence of all the regular oil and gas sands from the top of the "Big Injun" down to and including the Bayard Sand at 2293-2300', at 879 feet below the top of the Big Injun, and about 2350 feet below the horizon of the Pittsburgh Coal which crops about 60 feet above the derrick floor. Two other sand horizons are reported in this well at depths of 2630 feet and 2835 feet, respectively, and this latter might represent the Elizabeth Sand of the deep well near West Elizabeth, Pennsylvania, on the Wm. Bedell farm, since the latter comes at 1397 feet below the top of the Big Injun Sand, while the one at 2835 feet in the Patton well comes 1421 feet below the same horizon.

The sand producing gas struck at 2987 feet, 3047 feet below the Pittsburgh Coal and 1573 feet below the top of the Big Injun Sand in the Patton well, and at 1571 feet below the same horizon in the Burnside well near by, can not represent the Speechley Sand of the Pennsylvania series, since in the Burnside well it comes considerably farther above (1355′) the Benson Sand than it does above what has been identified as the Bradford Sand horizon in western Pennsylvania, where the "Speechley" Sand as identified in the records of two borings given on pages xliii and xliv of this discussion comes only 600 feet above the top of the "Bradford" of those wells, and 2000 feet in round numbers below the top of the Big Injun Sand. Then, too, in the record of the Bradys Bend well on page xxxix, the interval from the top of the Big Injun Sand (about 1200′) to the top of the "Speechley" is 1835 feet, which corresponds closely to the same in the two records given from Westmoreland County, and thus renders it probable that the **Burnside Sand** may represent either the Warren or Tiona Sand of the western Pennsylvania series, 300 to 400 feet above the true **Speechley** gas horizon.

The Hope Natural Gas Company has also developed a still deeper oil and gas horizon in West Virginia than the **"Benson" Sand** of the Reiley and other wells just described. This is on the great Burning Springs or Volcano Arch near the line between Wood and Ritchie Counties, a few miles northeast from Petroleum Station on the Baltimore and Ohio Railroad.

The record of this well, as given through the courtesy of the officers of the Hope Natural Gas Company, is as follows:

RECORD OF WELL NO. 4670 OF HOPE NATURAL GAS COMPANY.

Drilled on lease of Volcanic Oil and Coal Company, near crest of Burning Springs Anticlinal, Wood County, West Virginia; began drilling April 1, 1917.

	Thickness. Feet.	Total. Feet.
Unrecorded (mostly sandstone)	500	500
Sand	12	512
Unrecorded	3	515
Sand	73	588
Hard lime, "Big Lime"	12	600
Sand, Big Injun	40	640
Slate and shells to bottom of Berea Sand	260	900
Slate and shells	1700	2600
Very hard "lime" and shells and slate	1100	3700
White "lime" and shells	270	3970
Slate, soft, white	85	4055
Slate, white and shells	57	4112
Slate, white, and brown	48	4160
Slate, hard	10	4170
Slate, soft, chocolate-colored	33	4203
Shells, hard	62	4265
Shale, brown	15	4280
Lime shells	7	4287
Shale, brown, mixed with light, sandy layers	59	4346
Shells, soft, limy	14	4360
Shell, hard	2	4362
Shale, soft, chocolate-colored	18	4380
Shale, very soft, cinnamon-brown	50	4430
Shell, gray, hard	2	4432
Shale, cinnamon-colored, soft	38	4470
Shell, hard, gray	2	4472
Shell, light-brown	18	4490
Shell, gray	4	4494
Shale, chocolate-coloced	10	4504
Shell	1	4505
Slate, soft	7	4512
Shells	2	4514
Slate, soft, dark	13	4527
*Hard lime and sand, with nuggets of iron pyrites (gas and oil at 4531′)	4	4531

The "hard lime and sand" with oil and gas struck at 4527 feet may possibly represent the pebbly stratum struck just above the Corniferous Limestone at 4065 feet in the Derrick City well, or it may represent the Corniferous Limestone and Oriskany horizon with the flint absent. In any event, it lies geologically far below the "Benson" Sand horizon of Barbour, Harrison, and Lewis Counties, since the Devonian Shales thin rapidly westward, and at the longitude of Lancaster, Ohio, approximately 73 miles north 67½° west

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*Since the above record was closed the well has been drilled a few feet deeper into a gray sand (Oriskany), getting some water and a much larger amount of gas, the total being estimated at not less than 2,000,000 cubic feet.

from the Volcano deep well, the Upper Devonian Shales between the Berea Sand and the Corniferous Limestone, which already measure 3627 feet at the Volcano well, have thinned down to only 805 feet, a northwestward thinning of 38.6 feet to the mile, as shown by the Federal Fuel and Gas Company's well No. 1 drilled near Lancaster, the record of which is published in Bulletin No. 1, Fourth Series, Ohio Geological Survey, pages 117-118, and given herewith:

LANCASTER, OHIO, WELL.

The record of Federal Fuel and Gas Company's Well No. 1, drilled in the bed of the old canal, 4 miles below Lancaster, Ohio, as recorded on pages 118 and 119, Bulletin No. 1, Fourth Series, Ohio Geological Survey, reads as follows:

		Thickness. Feet.	Total. Feet.
Drive pipe (Glacial Drift)		54	54
Shale		91	145
White sand, water		20	165
Sandy shale		135	300
Gray shale		90	390
Shale (Sunbury, Orangeville)		52	442
Berea Sand (8¼" casing)		25	467
Red Shale, (Bedford), Catskill		103	570
Black shale..560' White shale..142	Chemung, Hamilton, and Marcellus	702	1272
Corniferous, Helderberg, Salina, and Niagara Limestones, (water at 1407' and 1682', cased 6⅝" at 1944')		687	1959
White slate..............66' Red rock (shales)........18 Limestone shell.......... 8 Blue slate................ 4 Shells ....15 Blue slate................ 5	Clinton Shales	116	2075
Sand, "Clinton" (Medina White) to bottom		13	2088

Here these Upper Devonian Shales, including Catskill, Chemung, Portage, Hamilton, and Marcellus, total only 805 feet between the Berea Grit and the top of the Corniferous Limestone, and westward from Lancaster, they still continue to thin away until a thickness of only 30 to 40 feet remains just east of the Cincinnati Arch.

The greatest thickening of these Upper Devonian beds appears to be southeastward toward the Alleghany Mountains, since in the Central City deep well on the Ohio River near

Huntington, West Virginia, S. 4° E. 85 miles from Lancaster, they have increased only 200 feet to 1005 feet, a rate of only 2-1/3 feet to the mile, while in the Edwards deep well on Slaughter Creek, Kanawha County, S. 29½° E. 115 miles, the record of which is published on page XVIII, Kanawha County Report, W. Va. Geological Survey, they have increased to 2840 feet, or at the rate of slightly more than 16 feet to the mile.

The northeastward thickening of the Devonian Shales from the vicinity of Lancaster to 6 miles east from Zanesville as also the character of the formations there is shown by the record of a well published on pages 36 and 37, Bulletin No. 12, Fourth Series, Ohio Geological Survey, as follows:

RECORD OF ZANESVILLE OIL AND GAS COMPANY'S WELL.

On land of George Handchey, 6 miles east of Zanesville, Section 25, Perry Township, Muskingum County, Ohio:

			Thickness. Feet.		Total Depth Feet.
Unrecorded			0	to	1010
Berea Sand			23	to	1033
Devonian (Ohio) Shales	Bedford red shales	15'	1607	to	2640
	Limestone	15			
	Shale and lime shells	1312			
	Lime shells	265			
"Big Lime"	Corniferous		1005	to	3645
	Helderberg				
	Salina				
	Niagara				
Clinton Shales	Black shales	5'	64	to	3709
	Lime shells	3			
	Shales	16			
	Sand shells	3			
	Shales	18			
	Red sandstone	4			
	Black shale	15			
Clinton (Medina) Sand			38	to	3747
Shales to bottom			58	to	3805

This record reveals a considerable thickening in both the Devonian Shales and the underlying limestone formations, Corniferous to Niagara, inclusive, in a direction from Lancaster, N. 71½° E., the Devonian Shales having a thickness of 1607 feet in the Zanesville well, or practically double that (805′) in the Lancaster test, while the "Big Lime" has also increased from 687 feet at Lancaster to 1005 feet in the Zanesville Oil and Gas Company's well, or a thickening of 318 feet.

THE DEEPEST WELL IN THE WORLD.

The deepest well in the world is the one put down by the Hope Natural Gas Company on the Martha O. Goff farm about 8 miles northeast from Clarksburg, Harrison County, West Virginia. Through the courtesy of Messrs. John B Corrin and John G. Pew, Vice-Presidents of the Hope Company, and John H. Williams, Superintendent of the drilling department, the record of this deepest well of all borings (Hope No. 4190), together with a sketch map (figure 23) showing its location, photos of the derrick, cable, drilling crew, etc., are given herewith. The well was begun with the idea of testing for deeper oil or gas horizons than any hitherto encountered in West Virginia, the intention being to drive it to the horizon of the "Clinton" (Medina) petroliferous Sand of Ohio, if possible. The Devonian Shales, however, having thickened over a thousand feet more than expected, this boring will most probably be stopped after penetrating and testing the Oriskany Sandstone, now only a few feet (probably not more than 20 to 30) below the present bottom (7386′) of the well where it is temporarily delayed with a fishing job, the steel cable having parted over 5000 feet down, thus leaving the tools and 2000 feet of cable in the hole. Mr. John H. Williams (to whose great skill and accomplishments in the art of drilling, aided by the splendid work of his resourceful crew, geology is indebted for the deepest well ever drilled) thinks that he can clear the well of the broken cable and tools, and then sink the same several hundred feet deeper, even to 8000 feet or more, the only trouble being to find a cable of the right strength and quality, some of them having parted with only a few hours' use. The complete history of this remarkable well is given in the following summary and record prepared by John B. Corrin and John H. Williams:

Statistics Concerning Deep Well Drilled By Hope Natural Gas Company.

LOCATION: On the Martha O. Goff farm of 620 acres in Simpson District, Harrison County, West Virginia, on the waters of Owens Fork of Booths Creek, 4½ miles northeast of the town of Bridgeport, on the the main highway from Fairmont to Clarksburg, W. Va. Well accurately located on the accompanying topographic sheet.

ELEVATION: Location made for well March 3rd, 1916, at a point 1164 feet above sea-level, and 200 feet below the level of the Pittsburgh seam of coal.

SUMMARY OF DRILLING: Drilling was commenced April 19, 1916, and on March 4, 1918, a depth of 7386 feet had been reached, thus exceeding by 37 feet the depth of the well hitherto known as "the deepest well in the world," located at Czuchow in Germany. Approximately 400 days have been spent in actual drilling, the remainder of the time the well has been shut down for repairs to rig, boilers, cables, etc., waiting for materials, minor fishing jobs, taking of temperatures, cleaning out cavings from the hole, etc. Fortunately, no serious fishing jobs have been encountered. The last known sand passed in the well was the Bayard Sand, at depth of 2300 to 2310 feet. Following is record of the various formations, and the dates showing progress of the work.

RECORD:

	Top. Feet.	Bottom. Feet.	
Native Coal (Elk Lick).......	83	86	
Little Dunkard Sand.........	170	186	
Big Dunkard Sand...........	305	336	
Gas Sand....................	436	446	
First Salt Sand..............	690	815	
Second Salt Sand............	860	880	
Maxton Sand................	1025	1040	
Little Lime.................	1183	1194	
Pencil Cave.................	1194	1210	
Big Lime....................	1210	1275	Gas at 1253'
Big Injun Sand..............	1275	1394	Water at 1304'
Squaw Sand.................	1410	1428	
Berea Sand..................	1512	1540	
Gantz Sand consolidated with Fifty-Foot		....	
Fifty-Foot Sand..............	1748	1885	Gas at 1749' and 1757'
Thirty-Foot Sand.............	1900	1980	
Gordon Stray Sand..........	2090	2097	
Gordon Sand.................	2130	2142	
Fourth Sand.................	None		
Fifth Sand..................	None		

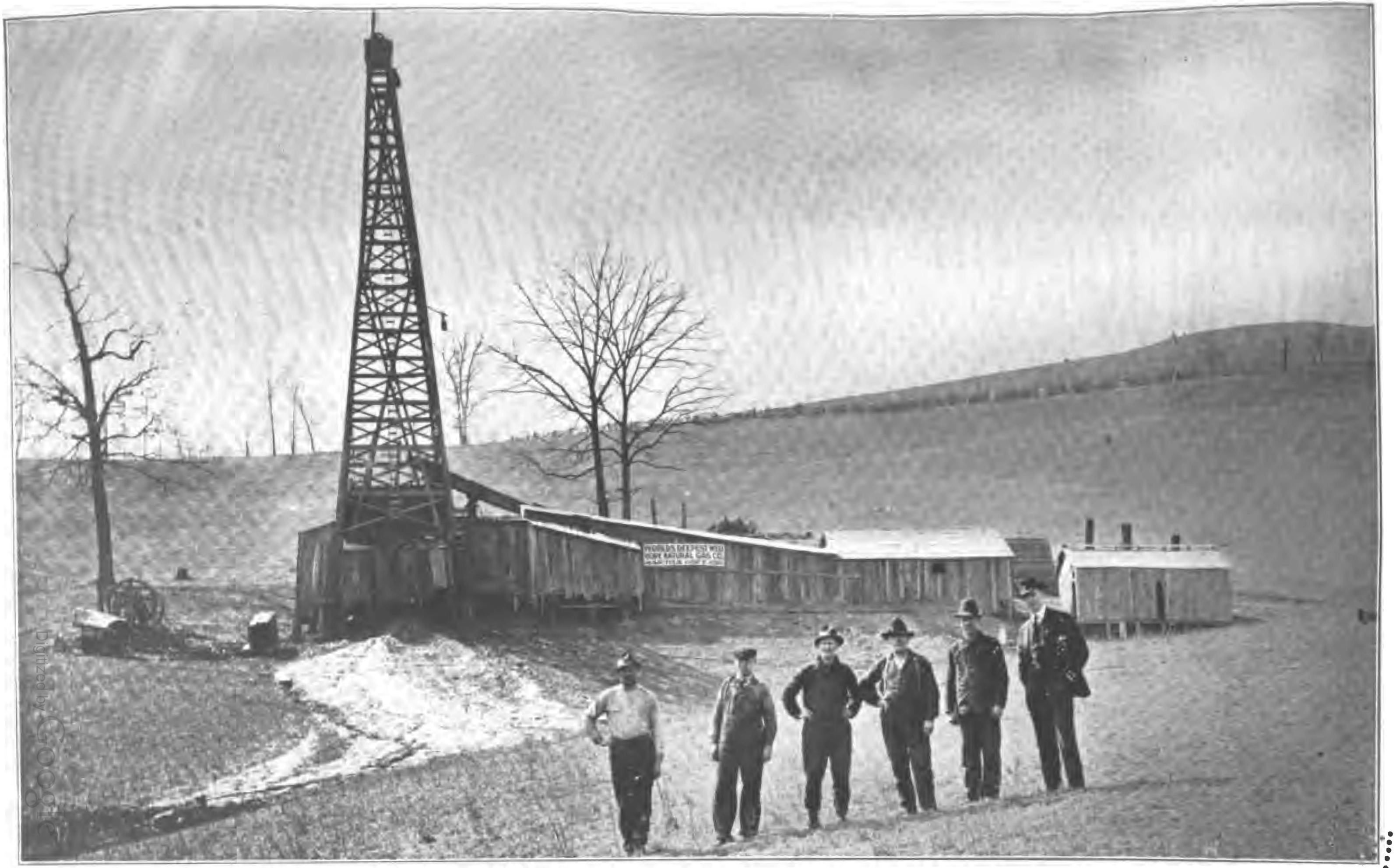

PLATE XLV.—Deepest Well in the World, Martha O. Goff, No. 4190 of the Hope Natural Gas Company, 8 miles northeast of Clarksburg, Harrison County, W. Va., and the men who drilled it; namely, (from left to right): James B. Wells, Tool Dresser; Charles Welch, Foreman; F. C. Davis, Tool Dresser; A. L. Rawlirs, Driller; E. C. Rummage, Driller; and John H. Williams, Superintendent

23, 1916

puff of air (gas)

8, 1916

nber 23, 1916
ry 6, 1917

ary 16, 1917

23, 1917

13, 1917
down 2 months,
lrs to rig, sand
, waiting for ca-
etc.

29, 1917

	Top. Feet.	Bottom. Feet.	
Slate	6750	6755	July 7, 1917
Dark slate	6755	6775	
Hard sand shells	6775	6780	
Black shale	6780	6800	
Black slate	6800	6823	
Hard lime	6823	6865	July 13, 1917
Slate and shells	6865	6950	
Hard lime	6950	7057	
Lime shells	7057	7069	Shut down 1½ months
Hard sand	7069	7071	
Hard lime	7069	7075	November 2, 1917
Lime	7081	7093	November 16, 1917
Hard lime	7093	7097	
Hard lime	7097	7110	
Slate and shells	7110	7150	December 21, 1917
Slate	7150	7160	
Hard lime	7160	7162	
Lime shells	7162	7176	
Gritty shells	7176	7190	
Slate	7190	7225	January 4, 1918
Slate	7225	7232	
Hard shell	7232	7245	
Black slate	7245	7251	
Slate and shells	7251	7256	
Hard lime	7256	7261	
Dark hard lime	7261	7266	
Black slate	7266	7280	
Hard shells	7280	7282	
Slate	7282	7290	
Soft slate	7290	7295	
Soft black slate	7295	7300	January 18, 1918
Black slate	7300	7345	
Gritty lime	7345	7363	Feb. 1 to Mar. 1, 1918, shut down taking temperatures and repairing rig.
Hard flinty limestone, Corniferous, to bottom	7363	7386	March 1-4, 1918. March 4, 1918, cable parted 2000′ above bottom.

SIZE OF HOLE:
16″ in diameter to depth of 217′.
13″ in diameter from 217′ to 1238′.
10″ in diameter from 1238′ to 2307′.
8″ in diameter from 2307′ to 7071′.
6′ in diameter from 7071′ to present depth.

CASING:
217 feet of 13-inch casing, set in slate.
1238 feet of 10-inch casing, set in Big Lime.
2307 feet of 8¼-inch casing, set in Bayard Sand.
1666 feet of 6-inch liner, set in well at 5405′ to 7071′, to protect hole from cavings.

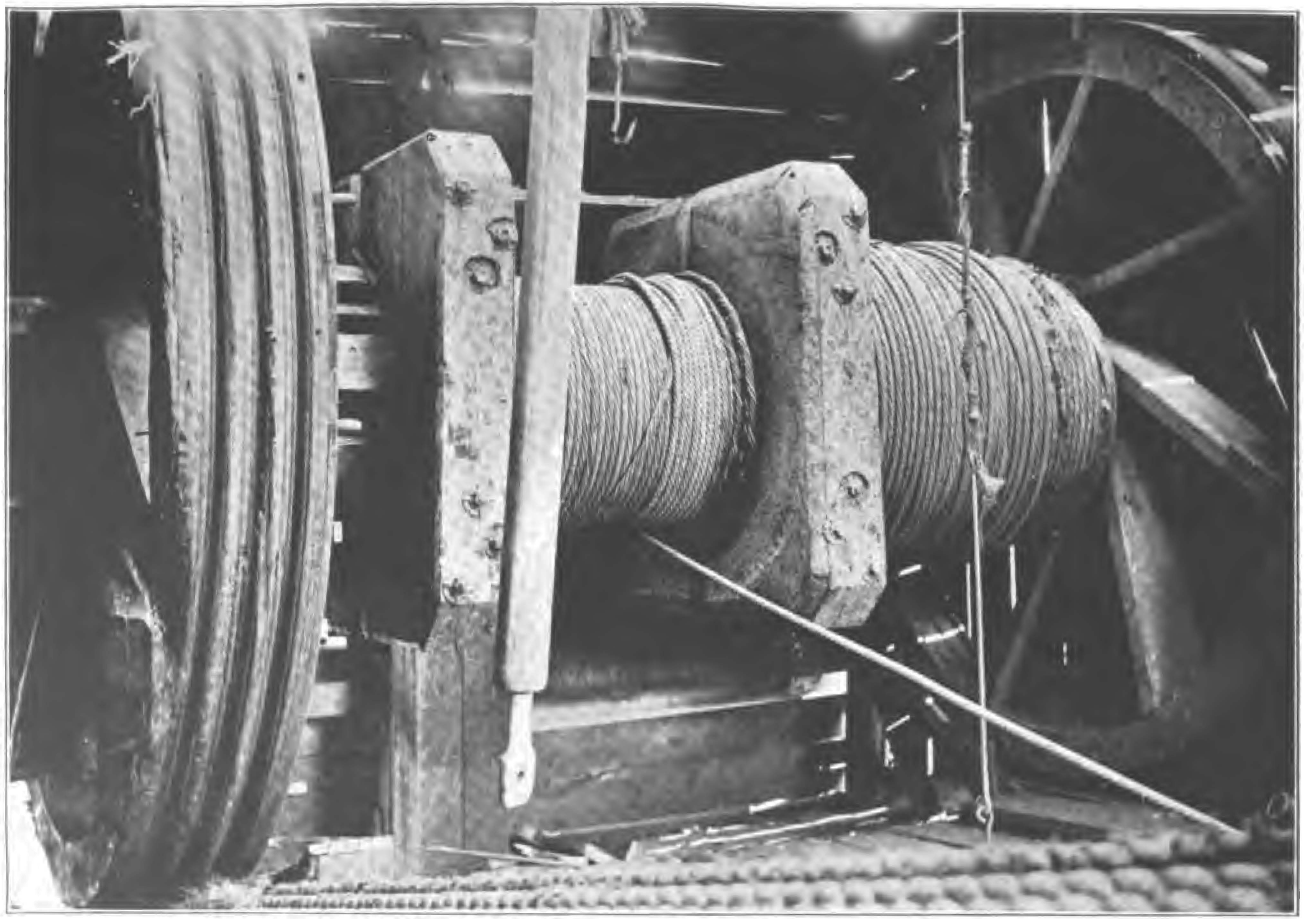

PLATE XLVI.—Bull Wheel and Cable at Goff Well.

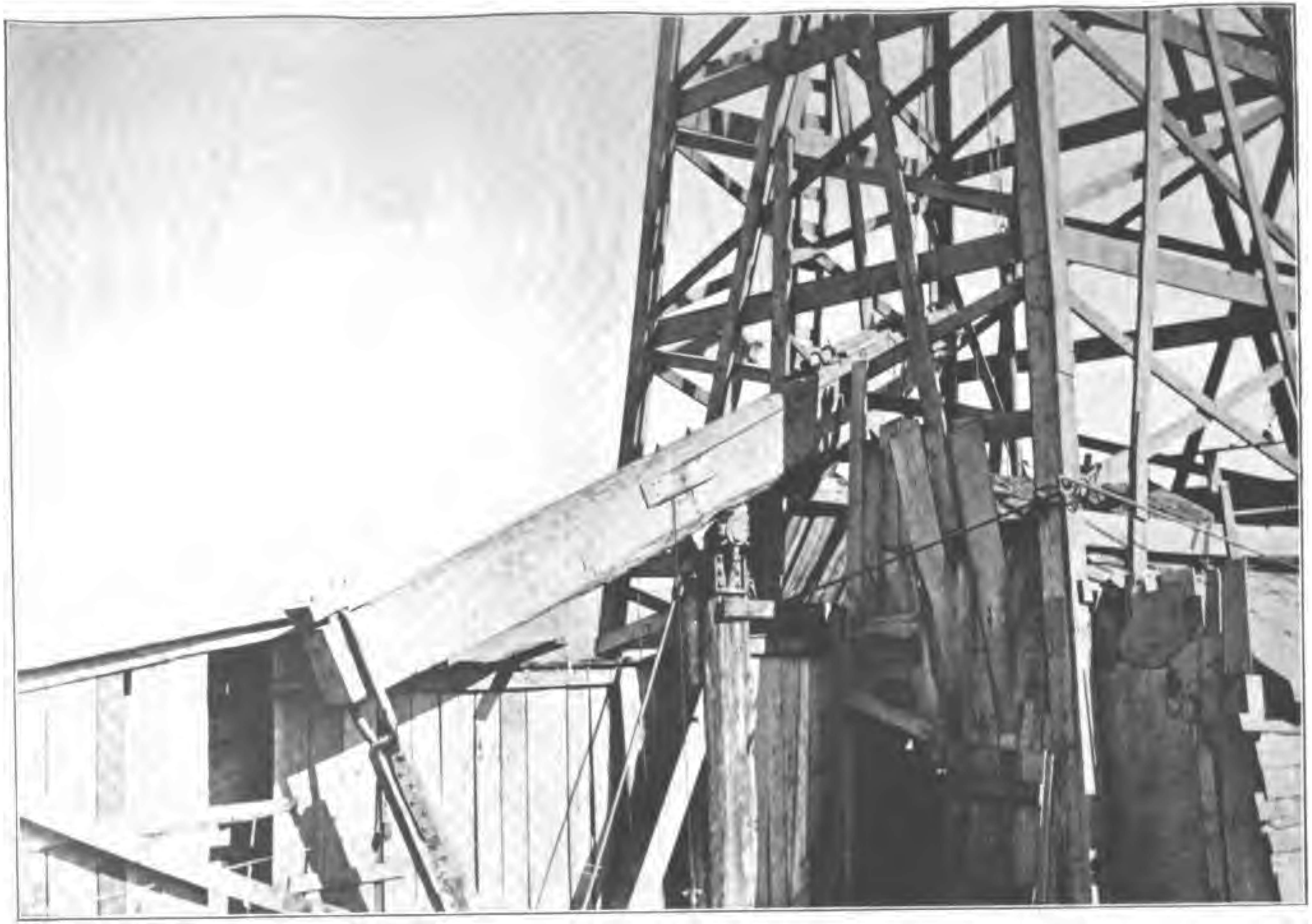

PLATE XLVII.—Walking Beam at Goff Well.

RIG:

Standard (wood), 96 feet high, with 22-ft. base of extra heavy timbers, Bull wheel shaft 24" in diameter, with Bull wheels 10′ in diameter, triple tug, having two 10′ brake wheels, with 14" brake band on one side, 10" on other side; three sets of bull wheels have been used. Band wheel is 14′ in diameter with 13" face, triple tug, carrying belt 18" wide. 150′ in length. Sand reel has 6" steel shaft, with 16" friction and brake wheel, and weighs approximately 8000 lbs., two of these sand reels having been used. Walking Beam is probably the heaviest and largest piece of timber ever used for this purpose, with Pitman, connected to the walking beam, also of unusual size and weight. Crown Pulley (top of rig) has 7" steel shaft, and weighs 1200 lbs. 4½ Standard rig irons were used to depth of 4500 feet, then replaced by special extra heavy rig irons (7½") which have been used to present depth. Rig has been reinforced and repaired from time to time. All work of erecting and repairing rig has been under the direction of George H. Stanfield, of Clarksburg, W. Va., Superintendent of Rig Building for the Hope Natural Gas Company.

BOILERS:

One 25 hp. Acme, used from top hole to 4500 feet.

On 25 hp. Brennen, coupled with the Acme at 4500′, the two boilers then being used from 4500′ to 7300′.

One 25 hp. Acme, put on at 7300′, the three boilers then being used from 7300′ to the present depth.

ENGINES:

One 12x12 Acme, 25 hp. used from top to 4500′.

One 16x16 Oil Well Supply, 80 hp., replaced the Acme at 4500′ and has been used from that depth to present time.

CABLES:

One second-hand Manilla, 2¼x700′, drilled to 150′.

One second-hand Manilla, 2¼x700′, drilled 150′ to 615′.

One new Manilla, 2¼x2800′, drilled 665′ to 2290′.

One new Wire, ⅞"x4000′, drilled 1070′.

One new tapered Wire, ⅞x1x1⅛x1¼x10,000′ drilled 1220′.

One new tapered Wire, ⅞x1x1⅛x1¼x10,000′, drilled, 525′.

One new tapered Wire, ⅞x1x1⅛"x7350′, drilled 790′.

One new Wire, 1"x7000′, drilled 32 feet, then used 48 days on cleaning out work.

One new Wire tapered, ⅞x1x1⅛x10,000′, used one day, broke, and was fished out of well.

One second-hand Wire, 1"x5000′, used one day.

One second-hand Wire, 1"x7000′, used one day.

TOOLS:

TO WHOM CREDIT IS DUE:

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follows, begin
above the mou

Pittsburgh C
Conemaugh
Allegheny .
Pottsville . .
Mauch Chur
Mountain (
Limesto
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expected increase in these strata from the region of the Geary well southward. This thickening is shown graphically by contours on the accompanying map (figure 24) and table of thicknesses (figure 25) at the several borings to which reference has been made. The records also show that while the Goff well is 138 feet deeper than the Geary well, yet the latter owing to this great thickening southward penetrated the geologic formations to a depth of about 1200 feet farther than the Goff, while the Seiberling well (in which the "Clinton" or Medina Sand was struck at 3500 feet or 1240 feet below the top of the Corniferous Limestone) had passed through the geologic column near Akron several hundred feet farther at 3749 feet, its total depth, than had the Geary well at 7248 feet, although the Seiberling well started only (1622—385) 1237 feet geologically below the Geary well, the base of the Berea Grit coming at 385 feet in the former and 1622 feet in the latter. Hence in figuring the depth to Ohio's Clinton Sand at any locality in western Pennsylvania, West Virginia, or southern Ohio, this thickening of the Upper Devonian Shales must be taken into account.

Fossil Life from the Goff Well.

Several samples of the rock materials brought up by the bailer from great depths in the Goff well were preserved by the drilling crew and Superintendent Williams. These, including the larger chips of slate, etc., were submitted to the geologists and paleontologists of the U. S. Geological Survey, at Washington, D. C., for careful examination and study. To Mr. Chas. Butts, Geologist on this Survey, was delegated the task of examining the same and reporting thereon, and the following interesting communication from Mr. Butts to the State Geologist describes what he found of marine life in these deeply buried sediments:

TABLE SHOWING DISTANCE (IN MILES) BETWEEN WELLS AND RATE OF INCREASE (+) AND DECREASE (−) IN THICKNESS OF UPPER DEVONIAN (Base of Berea Sand to Top of Corniferous Limestone) IN FEET PER MILE. (FIGURE 2B).

NAMES OF WELLS (Figures in parentheses show thickness in feet of Upper Devonian at the several wells). [TABLE TO BE READ ACROSS PAGE. SIGNS OF INCREASE (+) AND DECREASE (−) TO BE REVERSED IF READ DOWN].	LANCASTER (805')	DERRICK CITY (4350')	AKRON (1775')	BRADYS BEND (No measurement)	CROOKS (No measurement)	HAMILTON (No measurement)	GEARY (4386')	GOFF (5823')	VOLCANO (3627')	EDWARDS (2840')	CENTRAL CITY (1008')	ZANESVILLE (1607')
LANCASTER (805')		262	109	179	168	162	131	126	73	115	85	40
		+13.53'	+8.90'	— —	— —	— —	+33.48'	+39.82'	+38.66'	+17.69'	+2.38'	+20.05'
DERRICK CITY (4350')	262		165	88	113	120	140	201	237	304	320	224
	−13.53'		−15.61	— —	— —	— —	+0.26'	+7.33'	−3.05'	−5.00'	−10.45'	−12.27'
AKRON (1775')	109	165		98	101	104	76	133	123	195	187	78
	−8.90'	+15.61'		— —	— —	— —	+34.36'	+30.44'	+15.06'	+5.46'	−4.12'	−2.15'
BRADYS BEND (No measurement)	179	88	98		31	38	53	119	150	218	234	140
	— —	— —	— —		— —	— —	— —	— —	— —	— —	— —	— —
CROOKS (No measurement)	168	113	101	31		7	33	88	125	190	210	125
	— —	— —	— —	— —		— —	— —	— —	— —	— —	— —	— —
HAMILTON (No measurement)	162	120	104	38	7		32	82	120	184	205	123
	— —	— —	— —	— —	— —		— —	— —	— —	— —	— —	— —
GEARY (4386')	131	140	76	53	33	32		74	98	167	181	91
	−33.48'	−0.26'	−34.36'	— —	— —	— —		+19.42'	−7.74'	−9.26'	−18.68'	−29.44'
GOFF (5823')	126	201	133	119	88	82	74		56	106	138	98
	−39.82'	−7.33'	−30.44'	— —	— —	— —	−19.42'		−39.21'	−28.14'	−34.91'	−43.01'
VOLCANO (3627')	73	237	123'	150	125	120	98	56		74	85	57
	−38.66'	+3.05'	−15.06'	— —	— —	— —	+7.74'	+39.21'		−10.63'	−30.85'	−35.44'
EDWARDS (2840')	115	304	195	218	190	184	167	106	74		54	121
	−17.69'	+5.00'	−5.46'	— —	— —	— —	+9.26'.	+28.14'	+10.63'		−34.00'	−10.92'
CENTRAL CITY (1008')	85	320	187	234	210	205	181	138	85	54		109
	−2.35'	+10.45'	+4.12'	— —	— —	— —	+18.68'	+34.91'	+30.85'	+34.00'		+5.82'
ZANESVILLE (1607')	40	224	78	140	125	123	91	98	57	121	109	
	−20.05'	+12.27'	+2.15'	— —	— —	— —	+29.44'	+43.01'	+35.44'	+10.92'	−5.82'	

"DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
WASHINGTON

April 22, 1918.

"Dr. I. C. White, State Geologist,
Morgantown, West Virginia.

Dear Doctor White:

Samples of black shale from the Goff well have yielded the following fossils:

Depth, 7,187 feet........Styliola fissurella.
Depth, 7,285 feet........Styliola fissurella.
Depth, 7,290 feet........Fragments of brachiopod shell agreeing well with Leiorhynchus limitaris.
Styliola fissurella.
Conodont probably a form of Polygnathus dubius.
Fragment suggestive of Pharetrella.
Depth 7,350 feet........Small shell that Mr. Ulrich thinks may be an Estheria. Plenty in a few fragments of black limestone. While this seems likely to be a small Crustacean, the ornamentation does not agree with that of the described species from the Hamilton, Estheria pulex or Schizodiscus capsa.
Depth, 7,355 feet........Styliola fissurella.
Probably the black shale is Marcellus or Marcellus and Hamilton (Romney).

"Sincerely yours,
(Signed) "CHAS. BUTTS, Geologist."

Mr. Butts correctly diagnosed the shale in which the fossil animals occur at 7187 to 7355 as the Marcellus Black Shale of the New York geologic column, since the underlying Corniferous Limestone with its characteristic flint deposits or concretions was identified by the writer at a depth of 7363 feet, a splendid proof of the harmony of paleontology and stratigraphy as well as the wide distribution of the same life forms and to the wonderful persistency of sedimentary and lithologic characteristics over thousands of square miles of the earth's surface.

Temperature Measurements.

The first fairly accurate measurements of temperature in the deep borings of the Appalachian region were made during the year 1890 in a well on Boggs Run in the Ohio Valley, near Wheeling, West Virginia, by the late Wm. B. Hallock, Professor of Physics at Columbia University. By observations in near-by coal mines and from other data, Prof. Hallock reached the conclusion that the mean annual surface temperature at the Boggs Run well was 51.3° F., while he found a temperature of 110.3° F. at 4500 feet, thus agreeing very closely with the results given in the present discussion by Van Orstrand at the Geary (110.5° at 4600′), the Baxter Poling (110.8° at 4500′), and the J. H. Lake well (114.4° at 4500′). A few years later, Prof. Hallock also took temperature tests in the deep (5575′) well drilled by the late W. J. Young of the Forest Oil Company on the land of Wm. Bedell near West Elizabeth, Allegheny County, Pennsylvania. In this boring Prof. Hallock found the following temperatures at the corresponding depths:

Depths in Feet.	Temperatures in °F.
525	57
2252	64*
2397	78
5010	120
5380	127

The above results, except at 2252′ where a natural gas flow materially lowered the temperature, are in fair agreement with the other measurements given in this Chapter.

The West Virginia Geological Survey is very fortunate in being able to give to the scientific world the following very important contribution to our knowledge of underground temperatures in a portion of the Appalachian province that in all except one locality (Volcano) has not been materially affected by movements of the strata since their deposition.

The temperature at 4250 feet in the Volcano well; viz, 113.1° F., is practically the same as found in the Geary well at 4850 feet (113.2° F.), and only 1.1° lower than in the Goff well at 5000 feet (114.2° F.). These results suggest the possibility of higher earth temperatures in steeply folded regions, since the Volcano well is near the crest of the Volcano anticlinal with dips of 30° to 40° on each side of the same. Before this deep drilling campaign is finished by the Hope and Peoples Natural Gas Companies, it may be possible to have other wells than the Volcano tested by Mr. Van Orstrand in a region of steeply folded strata.

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*Gas at 227′.

Hallock, W., Subterranean Temperatures at Wheeling, W. Va., and Pittsburgh, Pa., Schools of Mines Quarterly, Vol. 18, pp. 148 to 154; Jan. 1897.

These very interesting determinations of earth temperatures, and illuminating discussion of methods, instruments, etc., by Mr. C. E. Van Orstrand, Physical Geologist of the U. S. Geological Survey, we owe to the cooperation and courtesy of Dr. Geo. Otis Smith, the distinguished Director of that Survey. The simple device of rapidly and accurately measuring the depths of deep well borings described and illustrated in Mr. Van Orstrand's contribution should prove a great boon to the oil and gas fraternity in not only securing greater accuracy but in the saving of much valuable time.

The following is a copy of the letter from Dr. Geo. Otis Smith, Director of the U. S. Geological Survey, in transmitting the results of Mr. Van Orstrand's work on deep well temperatures and other measurements:

"DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
WASHINGTON

Office of The Director May 8, 1918.

"Dr. I. C. White, State Geologist,
Morgantown, West Virginia.

"Dear Doctor White:

"On the eve of his departure for Texas, in response to a sudden call, Mr. Van Orstrand transmitted the accompanying manuscript and illustrations describing 'Apparatus for the Measurement of Temperatures in Deep Wells, and Temperature Determinations in some deep wells in Pennsylvania and West Virginia,' with the request that permission be granted for transmitting the material to you for publication.

"In the absence of Mr. Van Orstrand, it gives me pleasure to forward his report, which is essentially cooperative. You will find the report constitutes a valuable contribution to the knowledge of deep well conditions, although it covers the initial stage only of Mr. Van Orstrand's observations.

"At several points Mr. Van Orstrand has left blanks which you, through your familiarity with the organization of the operating companies, will probably have no difficulty in filling.

"Very truly yours,
(Signed) "GEO. OTIS SMITH, Director."

APPARATUS FOR THE MEASUREMENT OF TEMPERATURES IN DEEP WELLS, AND TEMPERATURE DETERMINATIONS IN SOME DEEP WELLS IN PENNSYLVANIA AND WEST VIRGINIA.

BY C. E. VAN ORSTRAND.[1]

Historical Note.—Nearly all of the deep earth temperature measurements have been made with mercury thermometers, which, in the case of non-flowing wells, have been lowered into the wells by means of a rope, steel wire, or some part of the well-drilling machinery. The oldest type of maximum thermometer, invented before 1790 by John Rutherford, consists of the usual mercury thermometer with a steel index which floats on top of the expanding mercury column. When the column contracts, the index adheres to the walls of the capillary tube. A magnet is used to bring the index to a lower level. In the Phillips or Walferdin type, the steel index is replaced by a short column of mercury, separated from the main column by a bubble of air. The most useful maximum thermometer, the Negretti and Zamba type, contains a constriction in the capillary tube just above the bulb. Mercury is easily forced past the constriction during expansion, but considerable jolting is required to return the mercury to the bulb on account of the thread being disconnected at the constriction when the bulb is cooled. In a modified form of this thermometer the bulb is placed by the side of the stem, the constriction is near the top of the bend, and the graduations read upward from the lower end of the inverted stem. Thermometers of the kind just described are oftentimes enclosed in sealed glass tubes which are capable of withstanding a hydrostatic pressure of two or more tons per square inch. The tube generally contains alcohol or mercury to facilitate thermal conduction to the bulb, and the thermometers are mounted in cork rings to prevent collision with the walls of the tube. An overflow thermometer, the earth thermometer of Magmus, has been used quite extensively in Germany. In this type of instrument, a glass bulb which terminates in a capillary is enclosed in a sealed tube, both the tube and the bulb being partly filled with mercury. The bulb and its capillary are not attached to the sealed tube, but are capable of an upward and downward motion. The instrument is read by heating in a bath until the mercury overflows from the bevelled end of the capillary when the temperature of the bath is read with an ordinary thermometer. Mercury is returned to the bulb by again heating to the point of overflow and then inverting the thermometer in the air. The cooling of the bulb draws the mercury upward through the capillary and into the bulb.

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[1] Published by permission of the Director of the United States Geological Survey.

The first report (1868) of the committee appointed by the British Association for the Advancement of Science for the investigation of underground temperatures contains a suggestion by Kelvin that a thermo-couple of iron and copper could be used to determine earth temperatures. In the following year, Kelvin succeeded in determining temperatures to a depth of 347 feet in the Blythswood drilled well. The method of measurement consisted in lowering one junction of the thermo-couple into the well while the other junction was heated or cooled by means of a bath of known temperature until a galvanometer showed no deflection. In the report of the committee for the year 1877, the possible electrical methods were indicated to be:

Siemens resistance thermometer.
Wheatstone telegraphic thermometer.
Becquerel's thermo-electric apparatus.

Very little progress has been made in the application of these suggestions. Rambaut and others[2] have used the electrical resistance thermometer at small depths with great skill and exceptional success. Puluj[3] used a so-called telethermometer in a 427-foot drilled well at Sauerbrunnen. The measuring apparatus is a differential resistance thermometer consisting of a carbon thread and a spiral iron wire of 163.28 and 26.584 ohms resistance, respectively. The two ends of these wires and the return lead are attached to platinum wires which are fused into the walls of a thin glass tube 21 centimeters long and 0.8 centimeter in diameter. The glass tube enclosing the thermometer is filled with hydrogen. Resistances were measured with a Wheatstone bridge. In his measurements of mine temperatures at Bendigo, Australia, Jenkins[4] used two platinum coils, one of which was heated in a bath of known temperature. A balanced condition of the Wheatstone bridge was indicated by a Compton reflecting galvanometer. The most recent application of electrical methods to the measurement of deep earth temperatures has been made by Johnston[5] and Adams. They determined temperatures to a depth of 2500 feet in a drilled well (C. H. Hibbs No. 4, South Penn Oil Co.) near Mannington, West Virginia. The bridge and galvanometer of the measuring apparatus were of a temporary character. A nickel resistance thermometer was used. The resistance of the coil was 250 ohms, consequently the temperature coefficient was about one ohm per degree centigrade. The coil was enclosed in a brass tube 1 centimeter in diameter and 30 centimeters in

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[2] Rambaut, A. A., Underground temperature at Oxford in the year 1899, as determined by five platinum resistance thermometers: Roy. Soc. London Philos. Trans., Vol. 195-A, pp. 235-238, 1909.

Callender, N. L., and McLeod, C. H., Observations of soil temperatures with electrical resistance thermometers: Roy. Soc. Canada Proc. and Trans., Vol. 2, 2d ser., pp. 109-126, 1896.

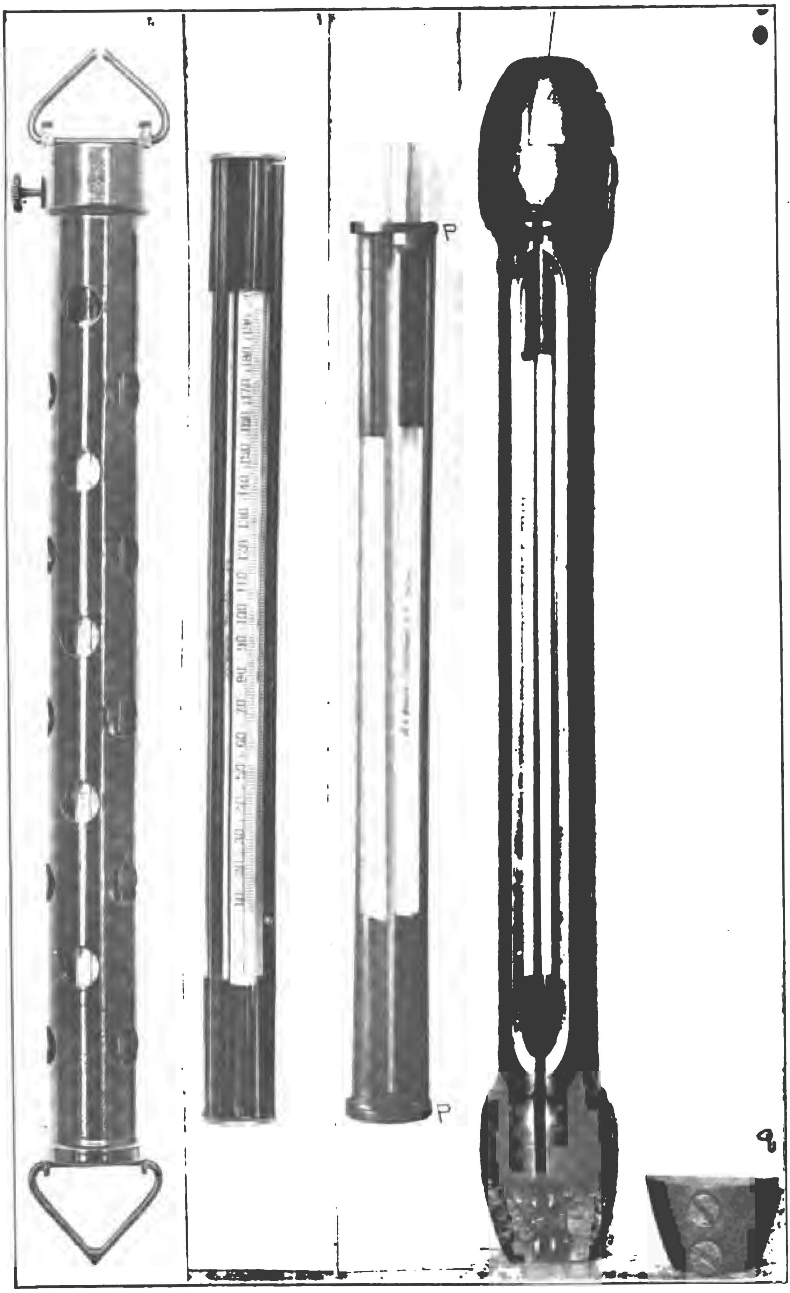
Heath, Thomas, Observations of the Edinburgh rock thermometers: Roy. Soc. Edinburgh Trans., Vol. 40, pp. 157-187, 1906.

[3] Puluj, J., Ueber die Temperatur-messungen in Bohrloche zu Sauerbrunn in Böhmen: Elektrotech. Zeitschr., Vol. 11, pp. 684-686, 1890.

[4] Jenkins, H. S., Rock temperatures and the rate of increase with increased depths in Victoria: Australian Assoc. Adv. Sci., Vol. 9, pp. 309-318, 1902.

British Assoc. Adv. Science Rept., pp. 51-55, 1904.

[5] Johnston, J., and Adams, L. H., On the measurement of temperature in bore-holes: Econ. Geology, Vol. XI, No. 3, pp. 741-762, 1916.



(a) (b) (c) (d)

PLATE XLVIII.—Metal Frames and Containers for Maximum Thermometers.

length. The tube containing the thermometer was filled with fusible alloy. This thermometer proved to be satisfactory, but Johnston and Adams are of the opinion that a thermo-couple possesses sufficient advantages over the resistance thermometer to justify its use.

Apparatus for use with mercury thermometers.—Both the direct and inverted types of maximum thermometer manufactured by H. J. Green, Brooklyn, N. Y., have been used. The diameter of the stem is 5-6 millimeters. The scale is subdivided into single degrees over a length of 14-16 millimeters between the limits 0 and 100° C., or 32 and 212° F. The latter scale is somewhat more convenient for field work.

Three thermometers of the direct type and two of the inverted type are supported in metal frames (2 by 24 centimeters) of heavy brass wire and thin copper tubes, as shown respectively by photographs (b) and (c), Plate XLVIII. The copper tubes are soldered to the brass plates (p). Each tube is split over the lower half and then contracted before the thermometer is put in position. Cotton is forced into the ends of the tubes and pressed against the ends of the thermometers as a further prevention of vertical oscillations. This simple device suffices to hold the thermometers with sufficient firmness. It possesses a minimum weight and enables the operator to adjust at the same time the mercury in all of the thermometers of a single set. Readings were taken with a thermometer reading telescope manufactured by Bausch and Lomb. It was readily adapted to the thermometers in the frame by removing the clamp and cutting V-shaped notches in the bottom of the tube.

The metal frames (b), (c) may be used in either of the bombs or containers (a), (d) Plate XLVIII. Bomb (a) consists of a thin brass tube with wire screen at the bottom of the tube, and also in the top of the brass cover which screws on at the upper end of the tube. A small piece of cotton is placed between the wire screen in the cover and the upper surface of the metal frame (b), or (c), to prevent oscillations of the thermometer within the bomb. One or more bombs of this kind were wrapped in wire screen and placed within the bailer at its upper end. Bomb (d) may be attached to wires or cables of small diameter passing longitudinally through its center by means of clamp (g) which presses the wire between the slots in the two screws shown at the bottom of the photograph. The covers at the ends of the tube are identical, except that the lower one is screwed into position and soldered to the tube. V-shaped openings in plates (p) permit the wire to pass through the center of the frames (b), (c). This bomb is 2 centimeters inside diameter and about 30 centimeters in total length. Its weight, including three thermometers and the supporting frames, is about 1.5 pounds. The weight could be reduced to 1 pound without undue sacrifice of safety. It will be noted that the two capped nuts remain in position when clamp (g) is removed. This is an important advantage in field work, as it enables the operator to remove the bombs from the wire quickly and without danger of losing the parts. The symmetrical arrangement of the bomb is an important feature in the elimination of impacts, for a bomb of this type will tend to slide along the inner wall of the casing.

It is convenient in handling thermometers in the field to have several brass tubes each sealed at one end with a metal cylinder of sufficient weight to cause the tube to stand vertically when partially submerged in ice water. The thermometers are thus kept dry and always remain in a vertical position. In handling maximum thermometers, the operator must continually guard against errors due to placing them in an inclined position.

For depths not exceeding 3260 feet, the thermometers were lowered into the wells by means of a No. 20 B. and S. gauge steel piano wire, operated by means of a reel and depth-measuring device mounted upon a steel supporting frame. The reel is 11 inches outside diameter, 6 inches inside diameter, 1.5 inches between plates, and has a carrying capacity of 10,000 feet of No. 20 wire. The depth-measuring device consists of a grooved brass wheel, the diameter at the bottom of the groove (7.607 inches) being such that the wheel makes one turn for each 2 feet of No. 20 B. and S. American gauge wire that is lowered into the well. The combination of reel and recording wheel on a single frame proved to be somewhat un-

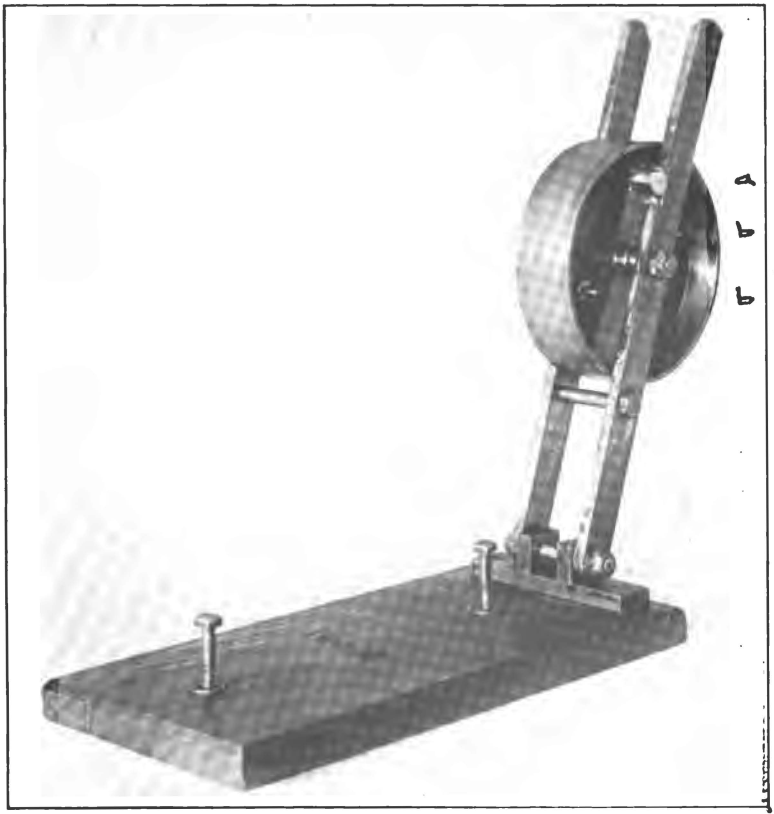


PLATE II.—Apparaturs for Measurement of Depth of Deep Wells by Means of the Sand Line.

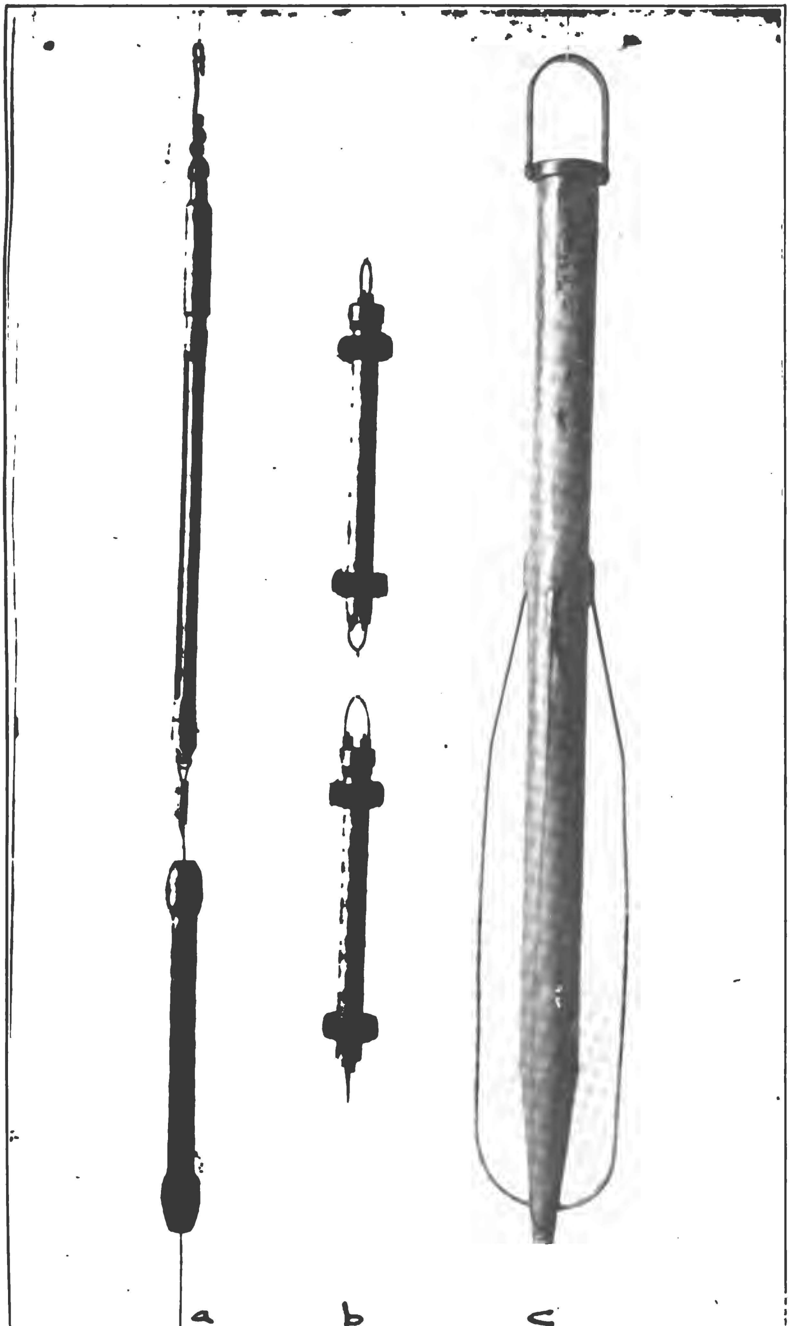


PLATE L.—(a) Mercury and Electric Resistance Thermometers Attached to the same line. (b) Thermometers for use in tin tube (c).

satisfactory on account of the difficulty of coiling the wire on the reel. The arrangement of parts shown in Plates LI and LII is more satisfactory as it enables the operator to place the reel at any convenient distance from the recording wheel.

A convenient method of lowering thermometers into the well by means of a sand line was suggested to me by Mr. Charles Welch of the Hope Natural Gas Company. The bailer is disconnected and the sand line threaded through one length of 1.25-inch wrought iron pipe. A loop in the end of the sand line is formed by forcing the end of the line into the lower end of the pipe. A tin tube (2 by 36 inches, Plate L-c) containing one or two sets of maximum thermometers (Plate L-b) is then attached to the loop by means of 8 or 10 feet of light weight wire cable. The bombs are held in position by means of strings attached to the upper and lower ends of the tube. Four wires on the side of the tube, and two rings of cloth, such as lamp wick, placed near the top and bottom of each bomb, serve to eliminate transverse shocks.

The depth recorder shown in Plate IL is used when the thermometers are lowered into the well by means of a sand line. It consists of a wheel of brass or cast iron whose circumference is 2 feet, diameter 7.639 inches, mounted between two metal bars, (3/8 by 1 1/4 by 18 inches). The distance between the bars, about 2 inches, is just sufficient to permit the wheel to turn freely. The bars are attached to a board (1 1/8 by 8 by 18 inches) by means of a joint consisting of a 1/2-inch bolt, 4 inches in length, passing through the lower ends of the bars, and a metal block which is attached firmly to the board. In operation it is only necessary to mount the board on a heavy wooden block and fix it to the floor at such a distance that the bars make an angle of about 45° with the horizontal when the sand line is in contact with the recording wheel. Depths are recorded by means of a Star No. 7 revolution counter[6], mounted on one of the bars as shown at (a) Plate IL. The counter is operated by two metal pins (b) Plate IL.

Apparatus for use with an electrical resistance thermometer.—The reel and depth-measuring device are shown in Plates

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[6] Manufactured by Veeder Manufacturing Co., Hartford, Conn.

LI and LII. The reel is 14 inches outside diameter, 6.5 inches inside diameter, and the distance between the plates is 6 inches. The total weight of the reel and steel supporting frame is 41 pounds. The brake consists of two pieces of steel tape encircling wooden blocks on each side of the reel. In operation, a small weight is attached to the end of the brake handle, thus applying the brake so as to require a small force applied to the handles to lower the wire or cable into the well. The advantage of this method of procedure consists in the fact that vertical oscillations are readily detected and damped before resulting in injury to the line. Three sockets for the insertion of electrical plugs are shown on the side of the reel just above the handle. The reel is held in position at any desired depth by inserting the ratchet (a) in the notches on the circumference of the plates. Dimensions of the reel and depth-measuring device are shown in Plates LI and LII. The latter consists of the usual grooved wheel and revolution counter; total weight including the steel frame, 10 pounds. Elliptical blocks of wood are attached to the cable at intervals of 100 or more feet by means of four small bolts. The cap nuts on the bolts are of the same type as (g) Plate XLVIII (d). It is important that details of this kind permit of quick and easy adjustment, otherwise valuable time is lost in manipulation.

The two pieces of apparatus just described are transported in wooden boxes. No adjustments or connections are necessary other than the attachment of the apparatus to the floor which is accomplished by means of steel pins driven into the floor and connected to the steel frame by means of rods and turn buckles, one of which is shown in Plate LI. The electrical measuring apparatus is mounted on a board, as shown in Plate LIII, and is transported in the box containing the depth-measuring apparatus.

The cable consists of one No. 20 high tensile strength, untinned steel aviator wire, and two No. 21 enamelled copper wires; outside diameter 3.3 millimeters, breaking load 200 pounds, total weight about 15 pounds per 1000 feet. Enamel was put on the steel wire by the manufacturer, Mr. A. F. Moore of Philadelphia. The result was not entirely satisfactory on

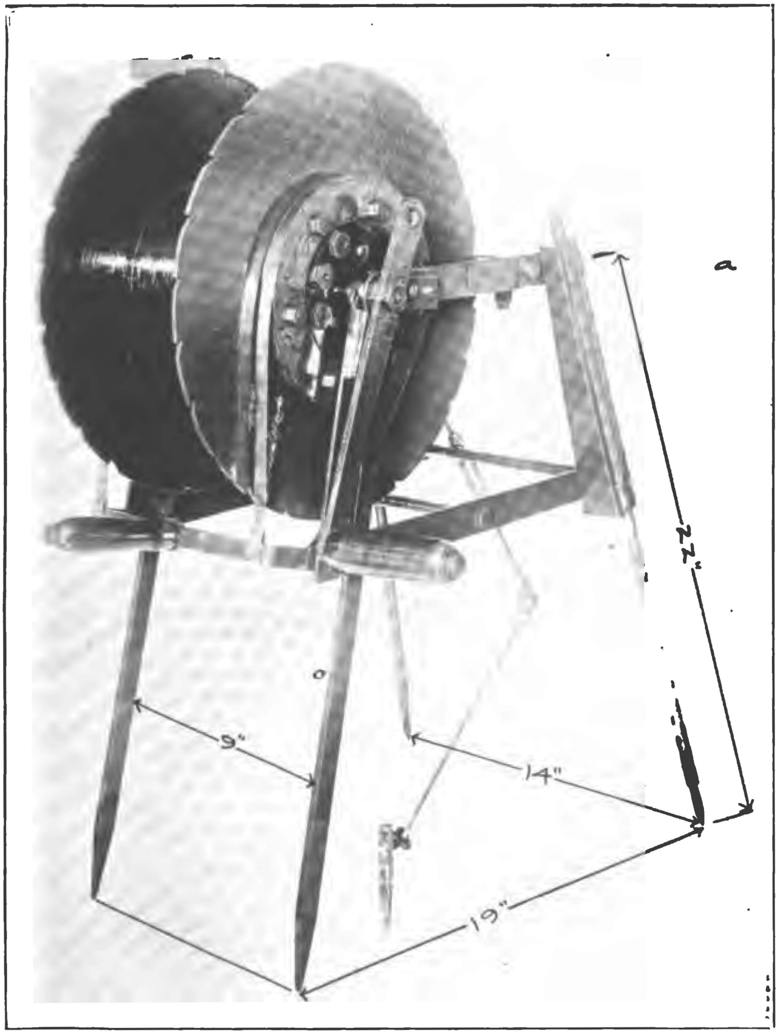

PLATE LI.—Reel for Electric Cable.

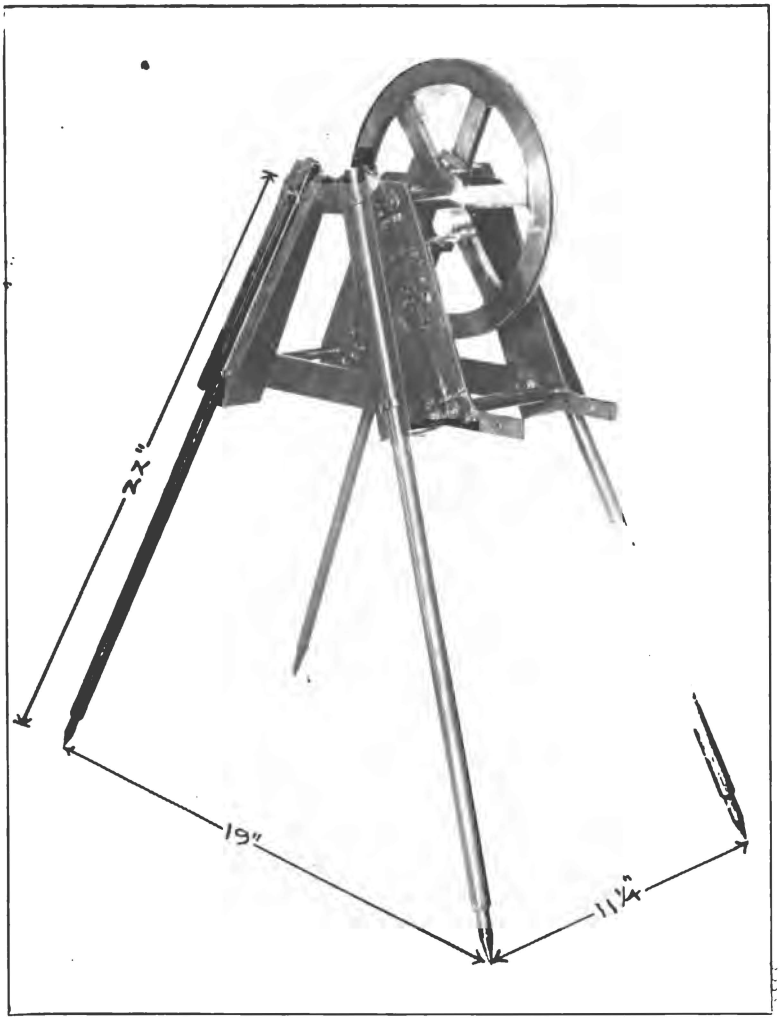

PLATE LII.—Depth Recording Device for use with Piano Wire or Electric Cable.

account of the enamel failing to adhere in spots. There was a slight diminution of the breaking load due to annealing during the enamelling process. Each of the three wires was inclosed in a double thickness of cloth insulation used by the U. S. Signal Service on buzzer wire. The three wires were then cabled and inclosed in a stout braid, the whole being thoroughly saturated in a moisture repelling compound. Natural oil ultimately dissolves all the insulating compounds with which I have experimented; consequently it is necessary from time to time to return the cable to the manufacturer for resaturation.

Nickel resistance thermometers are satisfactory but I have used a platinum thermometer of the quick acting type manufactured by Leeds and Northrup, Philadelphia. It has a resistance of 252.30 ohms at 0° C., consequently a variation of about one ohm per degree centigrade. The thermometer and the brass frame in which it is mounted are shown in Plate L (a). Details showing the connection of the cable with the electrical resistance thermometer will be given in a subsequent publication. A bomb containing three mercury thermometers (Plate L-a) is attached just below the resistance thermometer to a bronze cable about 10 feet in length and carrying at its lower end an elliptical brass weight 1¼ inches in diameter by 12 inches in length. The mercury thermometers are sometimes useful for the purpose of obtaining an independent check on the electrical measurements.

Plate LIII shows the arrangement of the different pieces of apparatus contained in the Wheatstone bridge; (a) is a damping key for the galvanometer, and (c) is a battery reversing key. The comparison arm of the bridge consists of a Leeds and Northrup dial resistance box (d) which is capable of comparing resistances to 0.1 ohm. The ratio arms, inclosed within the resistance box, were selected to give the greatest sensitiveness. It was found by experiment that the required resistance was about 300 ohms. The galvanometer (b) is of the Leeds and Northrup portable type with a sensitiveness of one scale division for 1/28,000,000 of an ampere. The galvanometer was found to be sufficiently sensitive when used with two dry cells (e). Three volts gave a sensitiveness of about four scale divisions for a change of 0.1 ohm in the dial resistance of the Wheatstone bridge. This sensitiveness sufficed to take readings to 0.01 of an ohm, or approximately 0.01° C.

Suggestions in regard to methods of measuring temperatures in deep wells.—Maximum theremometers are not entirely satisfactory for temperature measurements. In the first place, it is practically impossible to obtain correct readings when the temperature to be measured is lower than that of the air at higher levels, unless the extra precaution is taken of imbedding the thermometers in wax or paraffin. Another troublesome source of error is due to impacts and oscillations encountered in removing thermometers from the well. I experienced no difficulty in raising or lowering thermometers with a piano wire, but errors of this kind may be serious when the sand line is used. Perhaps the most unfortunate feature of this kind of error is the fact that it may not be discovered; the readings of three thermometers in a bomb may agree among themselves, although the average result is seriously in error. Another serious disadvantage in the use of the maximum thermometer is the unknown time required for it to acquire the temperature at a given point. Ordinarily an exposure of one hour is required. No definite rule can be given, however, as the required time evidently depends on the temperature at depth and the temperature of the apparatus when it enters the well.

My tests in the field have proved the superiority of the electrical resistance thermometer for depths not exceeding 3000 feet. The time required for the thermometer shown in Plate L (a) to acquire a correct temperature is about 20 minutes when readings are taken at intervals of 100 feet. A reduction in weight of the metal frame in which the thermometer is mounted may reduce the required time to 15 or possibly 10 minutes; a further reduction seems doubtful. A thermo-couple would of course be free from this objection, but the necessity of using an ice point renders this type of instrument impracticable for general service in isolated fields.

For depths not exceeding 4000 or possibly 4500 feet, I suggest an electric cable consisting of two No. 20 enamelled steel

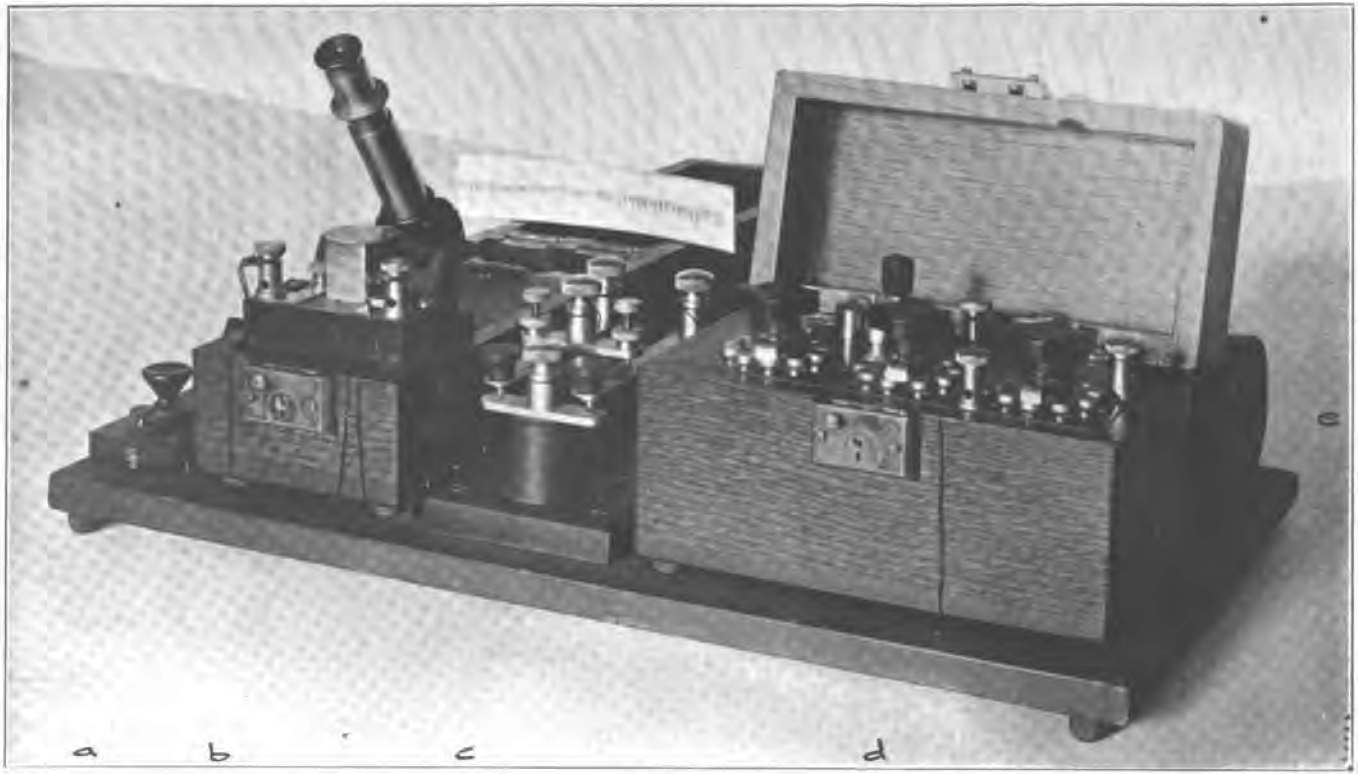

PLATE LIII.—Apparatus for use with Electric Resistance Thermometer.

aviator wires and two No. 21 enamelled copper wires; each wire to be insulated and cabled as explained in the preceding pages. A cable of this description would have a diameter of about 5 millimeters; a total carrying capacity of about 400 pounds, and a weight of from 20 to 25 pounds per 1000 feet. It could be lowered into the well by means of hand operated machinery of the type shown in Plates LI and LII; the only modification required would be a slight enlargement of the reel and possibly the attachment of a cog gearing to the steel frame. The apparatus shown in Plate LII could be used to measure depths with cables of any diameter by merely attaching to the steel frame a flat rimmed wheel like the one shown in Plate IL. The various pieces of measuring apparatus shown in Plate LIII could of course be combined into a single instrument.

The use of electrical apparatus in wells exceeding 4500 feet in depth is probably prohibited by the expense of construction and manipulation of the cable. The best method of procedure in this case appears to be to use the apparatus shown in Plates L-b and L-c in connection with the depth recorder, Plate IL, and sand line as previously explained. The best results are obtained with two sets of three thermometers, one set being inverted. Agreement of the readings in the two sets is generally a sufficient criterion for accuracy. The chief difficulties thus far encountered in this method of measurement is caused by impulses transmitted to the sand line from the engine and impacts caused by the slipping of the coils of the sand line on the reel. An attempt is being made to devise a shock arrester for the purpose of overcoming these defects. Thermometers of the inverted type, Plate XLVIII-c, may prove to be satisfactory. I have not used them sufficiently to justify comparison with the direct type when used in both the direct and inverted position.

The depth recorder, Plate IL, is superior to the steel tape in all of the essential features, namely, safety, durability, accuracy, and simplicity in construction and operation. An error of 0.01 inch in the diameter produces an error of about 15 inches per 1000 feet of measured length. Almost any required degree of accuracy can be obtained by properly standardizing the wheel. A small correction should be aplied for thermal expansion of the line when measurements of the very highest precision are made. Repeated tests prove that the sand line does not slip on the rim of the wheel. It is good practice in operating the recorder to pass the sand line through a V-shaped notch in a board which is tacked lightly to the floor.

Remarks on the data of observation.—My first observations are summarized in Tables 1 to 4 inclusive, and represented graphically in Figure 27. All of these observations were made with sets of three thermometers, each set being attached to a No. 20 B. & S. gauge steel piano wire by means of brass containers of the type shown in Plate XLVIII (d).

Plots of the depth-temperature curves in Figure 27 show clearly some of the anomolies produced by escaping gas. Well E. D. Ice No. 2 yielded a small quantity of oil but was practically free from gas. Its depth-temperature curve is, therefore, a good standard for comparison. The extended curve passes near the points representing the temperatures at the lowest points in wells Hibbs No. 4 and Blackshire No. 14. The rate of temperature increase deduced by the method of least squares from the entire curve thus extended is 1° F. in 91.3 feet.

A flow of gas from the depths 2218-32 feet in the Hibbs well was discharged into a pipe-line which was closed during the period of observation. No explanation is offered for the slight drop in this region of the depth-temperature curve. The depression is apparently independent of the gas flow, for observations made by Johnston and Adams[7] during the three days immediately following the closing of the pipe-line are in close agreement with my observations which were made from four to six days after the line had been closed. The abrupt changes which occur in the vicinity of 3044 feet are due to the expansion of a very small quantity of gas which entered the well at this point and escaped slowly into the atmosphere at the mouth of the well. Assuming the computed curve of the extended E. D. Ice well No. 2 to represent normal temperatures in this region, the reduction in temperature due to expansion ot gas at the depth of 3044 feet is 5.9° F. The entire curve from the point of maximum gas flow (3044 feet) to the surface appears to be too low.

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[7] *Op. cit.*

The observations by Johnston and Adams are represented in Figure 27 by a dotted line. Our observations are in close agreement over the interval from 1000 to 2500 feet, the lowest level at which they obtained a temperature record, but small differences occur between the 1000-foot point and the surface. My observations were made when the surface temperature was abnormally high. Three sets of reading at the 100-foot point gave the results:

13.8° C	12.3° C	12.0° C
13.5	12.3	12.0
13.5	12.4	12.0
13.6	12.3	12.0

the respective time intervals being 1.50, 1.75, and 2.00 hours. I infer from the difficulty experienced in returning the mercury to the thermometer bulbs; also from the general trend of the depth-temperature curve, that the last reading, 12° C., is too high. The value, 13.36° C. obtained by Johnston and Adams, implies a variation of more than 5° F. in the annual temperature at a depth of 100 feet and a penetration of the annual wave to a depth of at least 300 feet. Good observations beneath approximately level surfaces prove that the annual wave disappears at depths ranging from 50 to 100 feet. Some allowance should be made for the slope of the ground, but it seems to me to be rather improbable that this will suffice to explain the large variation of 5° F. I obtained results of a similar character with an electrical resistance thermometer in the 10-inch pipe of the Volcano well. The observed values are represented by the dotted line in Figure 38. Subsequent observations with maximum thermometers, exposed for a period of 8 or more hours in a 6-inch pipe, gave results which, when plotted, practically coincided with points on a continuation of the straight line representing the observations at the lower levels.

The effects of cooling and convection are shown clearly in wells C. D. Morgan No. 6 and J. R. Blackshire No. 14. Gas entered the Morgan well at a depth of 1985 feet and was discharged into a pool formed by oil which entered the well at a depth of 1990 feet. The daily discharge of gas into the atmosphere at the time the observations were made was estimated to be 40,000 cubic feet. The reduction in temperature obtained by comparison with E. D. Ice well No. 2 is 3.6° F. Similarly, the reduction in temperature due to the daily discharge of 567,750 cubic feet of gas at a depth of 2930 feet in the Blackshire well is 8.4° F. The temperature is again reduced by a discharge of 431,040 cubic feet of gas at a depth of 2560 feet, but the combined effect of these two discharges does not suffice to offset the increment in temperature at the higher levels due to friction and convection. The combined effects of friction and convection are further shown by comparison of the surface temperatures obtained by interpolation from the observed values at 250 and 500 feet, with the mean annual temperature[8] of 51.9° F. at Mannington. The results are:

Blackshire No. 14	Temperature at surface 57.8° F.	Increment +5.9° F.
Morgan No. 6	Temperature at surface 54.1°	Increment +2.2°
Ice No. 2	Temperature at surface 52.4°	Increment +0.5°
Hibbs No. 4	Temperature at surface 51.6°	Increment —0.3°
Hibbs No. 4	Temperature at surface 52.3°	Increment +0.4°

My observations in the Hibbs well show a reduction of 0.3° F. in temperature at the surface, whereas the observations by Johnston and Adams show an increase of 0.4° F. It is impossible to deduce a definite conclusion from these observations as the mouth of the Hibbs well is probably about 350 feet (figure 28) above the Weather Bureau station at Mannington. The mean annual temperature at Fairmont is 53.3° F.; at Morgantown 53.2° F. There can be no question, therefore, in regard to the increase in temperature at points near the surface in the Morgan and Blackshire wells.

Tables 5 and 6 contain the results of observation with an electrical resistance thermometer in well C. D. Morgan No. 7 and well E. T. Price No. 9. (See figures 29 and 30.) Oil in considerable quantity was pumped from the depths 2875 and 2888 feet in the Morgan well. A small quantity of gas entered the well at or near the same points. The upper curve represents readings taken when the oil had risen to a height of about 400 feet from the bottom of the well. The reduction in temperature at the approximate level of the oil surface is 2.5° F. From a point near the surface of the oil to a depth of about 200 feet in the oil, the increase in temperature is only 0.06° F. The lower curve represents readings taken after the well had been bailed. The slight diminution in temperature is no doubt due to the increased flow of gas. The total observed reduction in temperature from the points of entrance of the oil and gas at 2875 and 2888 feet, to the oil surface at 2450 feet is 4.5° F. The normal temperature at a depth of 2888 feet, deduced from the record of Ice well No. 2, is 85.1° F., or 1.9° F. higher than the observed rock temperature at this depth.

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[8] Climatological data for the United States by sections: U. S. Dept. Agr. Weather Bur., Vol. 22, No. 13, 1916.

Drilling had been discontinued a few days before observations were begun in the Price well. In the meantime a shallow pool of oil had collected in the bottom of the well. Gas escaped into the atmosphere in volume just sufficient to be visible in sunlight. The observed temperature of the oil, 83.14° F. at a depth of 2960 feet, is 2.9° F. lower than the corresponding rock temperature computed from the assumed standard curve in this region, and 0.05° F. lower than the temperature of the oil at a depth of 2888 feet in the Morgan well.

The results of temperature observations in the deep well near McDonald, 15 miles southwest of Pittsburgh, Pa., are summarized in Table 7. The observations were made with two sets of maximum thermometers of the type shown in Plate XLVIII. One set of thermometers was attached at a distance of 100, the other at 350 feet from the lower end of the bailer. This method of procedure proved to be rather unsatisfactory. Depths were measured with the recorder shown in Plate IL. The rapid increase in temperature above the enormous volume of water at 6520 feet is significant. A depression of the curve in this region is due to gas which enters the well at a depth of 6530 feet. From this point to the bottom, the rocks were apparently cooled by descending water which had already been cooled by expanding gas. Water was bailed from the well each morning before the observations were begun. Its natural level is about 2000 feet from the surface of the ground.

Tables 8 to 13, inclusive, contain temperature observations and well records of 6 deep wells in the vicinity of Clarksburg, W. Va. Drilling had generally been discontinued temporarily for several days preceding the observations. Results tabulated to hundredths of a degree were obtained with an electrical resistance thermometer. All other values are records from maximum thermometers of the type shown in Plate XLVIII and attached to the sand line as explained on page lxxi. Depths were measured with the recorder previously described.

Observations at the Lake and Volcano wells show that the temperature of water in the bailer is largely a matter of accident; it may be a few degrees higher or lower than the temperature of the rocks at the bottom of the well. The small undulations in the curve of the Lake well are due to accidental errors of observations. Preference should be given to the higher points. Small abrupt changes in the curves of the Goff, Robinson, and Baxter Poling wells are caused by small influxes of gas. In general, however, the curves rise with wonderful regularity from a temperature near the surface corresponding to the mean annual temperature at the point, to a much higher temperature at the bottom of the well. In the case of the Goff well, the total increment from 100 to 7310 feet is 102.7° F.; and the maximum deviation from an average curve does not exceed 0.4 or 0.5° F.

Comparison with observations of temperature in other wells of exceptional depth.—In order of depth, the three deepest wells of the world are Geary (7248 feet), Czuchow, Germany (7348 feet), and Goff (7386 feet). A temperature of 182.1° F. was recorded at a depth of 7287 feet in the Czuchow[9] well. Unfortunately, this record is of little value as the range of errors in portions of the curve are of the order of magnitude of 10° F., and for points near the surface, comparison with the mean annual temperature of about 46.0° F., shows that the curve in this region is about 25° F. too high. Another important temperature record was obtained in a well of less depth (6573 feet) at Paruschowitz,[10] not far distant from Czuchow. The observed points fall approximately on a straight line, but in this case also, comparison with the mean annual temperature (about 46.5° F.) shows that the observations at points near the surface are probably too high, the errors ranging in magnitude from 5° to 8° F. If this correction is applied throughout the entire curve, the results do not differ greatly from those obtained at Volcano. Observations to a depth of 5630 feet in a well at Schladebach,[11] near Leipzig, appear to be trustworthy. The results do not differ materially from those given in this paper, or from those published a number of years ago by Prof. Hallock.[12]

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[9] Michael R., Temperaturemessungen in tiefbohrloch Czuchow im Oberschleisien: Deutsche Geologische Gesellschaft, Zeitschrift, Bd. XLI, pp. 410-414, 1909; Neues Jahrbuch für Minerologie II, pp. 378-379, 1910.

Michael, R., und Quitzow, W., Temperature im tiefbohrloch Czuchow II. Centralbl. f. Min., No. 2, pp. 43-45, 1912.

Summary and some general conclusions.—Observations of temperatures in six deep wells in the vicinity of Mannington, West Virginia, were made primarily for the purpose of testing apparatus which had been constructed for deep well investigations. Incidentally, some information has been obtained on the cooling produced by flowing oil and gas. It appears from these limited observations that a flow of 567,750 cubic feet of gas per day from a depth of 2930 feet, may not lower the temperature at the point of inflow by more than 10° F.; on the other hand, a small flow from a depth of 3044 feet, just sufficient to be visible in sunlight, lowers the temperature to the extent of about 6° F. The effects produced above the point of inflow are dependent upon friction, convection, and conduction; consequently, the resulting temperature may be a few degrees higher or lower than the normal rock temperature.

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[10] Henrich, F., Uber die Temperatur verhältnisse im den Bohrloch Paruschowitz V. Zeitschrift für Praktische Geologie 12, pp. 316-320, 1904.

Report on underground temperatures: British Assoc. Adv. Sci., pp. 64-71, 1901.

Underground temperatures in the Paruschowitz No. 5 Boring, Germany: Inst. Min. Eng. Trans., Vol. 27, pp. 592-593, 1903-4.

[11] Dunker, E., Ueber die Temperatur-Beobachtungen im Bohrloche zu Schladebach: Neues Jahrb., Vol. I, pp. 29-47, 1889.

Kobrick: Ueber Messungen der Erd-Temperatur im der Bohrlöchern zu Schladebach und Sennewitz: Zeitschr, Berg.-Hutten-u. Salinenwesen Preuss. St., Vol. 37, pp. 171-190, 1889.

Report on underground temperature: British Assoc. Adv. Sci., pp. 35-40, 1889.

[12] Hallock, W., Subterranean temperatures at Wheeling, West Virginia, and Pittsburgh, Pennsylvania: School of Mines Quart. Vol. 18, pp. 148-154, Jan. 1897.

Underground temperatures at great depths: Am. Jour, Sci., 4th ser., Vol. 154, p. 76, 1897.

Preliminary report of observations at the deep well, Wheeling, West Virginia: Am. Jour. Sci., 3d ser., Vol. 43, pp. 234-236, 1892; Am. Assoc. Adv. Sci. Proc., Vol. 40, pp. 257-259, Aug. 1891.

U. S. Geol. Survey Thirteenth Ann. Rept., pt. 1, pp. 95-97, 1891-92; Fourteenth Ann. Rept., pt. 1, pp. 159-160, 1892-93.

Several of the wells penetrate coal seams. There appears to be no well-defined evidence of extraneous heat, either above or below the seams.

Theoretically, the depth-temperature curve should be either a straight line or a curve with a slight convexity toward the axis of temperatures. Curves shown in figures 27, 29, and 30 conform in a general way to this requirement, but the convexity is apparently due to flowing gas. Curves shown in figures 32, 38, and 40 represent temperatures in wells which are practically free from gas, but the curve is in each case, concave instead of convex toward the axis of temperatures. This general depression may be due to minute quantities of gas escaping from the rocks throughout the entire length of the well, or it may be due to water in the rocks. Considered from the latter point of view, the curve of the Goff well, for example, when compared with a normal curve, may afford a means of determining the relative water content of the rocks in situ.

The curve representing temperatures in the Bennett well, figure 35, agrees with theory. The rate of temperature increase, deduced by the method of least squares, is 1° F. in 84.7 feet. The maximum deviation from the straight line is 0.6° F., and the probable error of an observation of weight unity is 0.21° F.

Although the general form of the depth-temperature curves generally deviates somewhat from the theoretical curves, there is no exception to the general conclusion that temperature in the crust of the earth increases quite rapidly with the depth. This phenomenon may be an important factor in the evolution of certain materials in the crust of the earth, for it is well established by both theory and experiment that substances in suspension, or in solid or fluid solution, tend to migrate in the direction of diminishing temperature. The higher temperatures at the lower levels in the crust of the earth must, therefore, tend to cause a migration of certain substances toward the surface; the migration, except in case of isolated local disturbances, is never toward the center of the earth. These facts, in connection with some other well-established facts, namely, that carbon dioxide is a constituent of meteorites; that spectroscopic observations prove the existence of gases in nabulae, and of hydrocarbons, exhibiting the spectra of artificial gas, in cometary masses: all of these facts point to the possibility of a gradual evolution of gas and oil deposits from the original nebula, which in its essential features differs in no respect from the evolution of water or the gaseous constituents of the atmosphere: each substance has been brought to the surface of the earth under the influence of a directional force, due to the cooling of the globe, which tends at all times to cause migration in the direction of diminishing depth and temperature.

Acknowledgments.—Investigations of the character described in this paper can not of course be conducted without the cooperation of oil and gas companies. I am greatly indebted in this respect to the officials and employees of the South Penn Oil Company, the Peoples Natural Gas Company, and the Hope Natural Gas Company of Pittsburgh, Pa. Investigations were begun through the courtesy of Mr. E. E. Crocker, Vice-President of the South Penn Oil Company, who placed exceptional facilities at my disposal for the preliminary experiments in the Mannington field. Observations in the deep wells at McDonald, Pa., and several deep wells in the vicinity of Clarksburg, W. Va., were made possible through the interest of Dr. I. C. White, State Geologist of West Virginia, Captain L. F. Barger, General Manager of the Peoples Natural Gas Company, and Messrs. John B. Corrin and John G. Pew, Vice-Presidents of the Hope Natural Gas

Company. Superintendents J. H. Williams, at Clarksburg, and H. R. Williams, at Mannington, West Virginia, contributed in various ways to my success. Special credit is due Messrs. A. L. Rawlins and John L. Ritchie, drillers at the Goff well, and Messrs. C. W. Schwab and E. R. Alford, drillers at the Geary well, for their assistance in obtaining complete records of these most important wells.

I am indebted also to Mr. C. D. White and Mr. G. F. Becker of the U. S. Geological Survey, for their interest and cooperation throughout the entire course of the investigation.

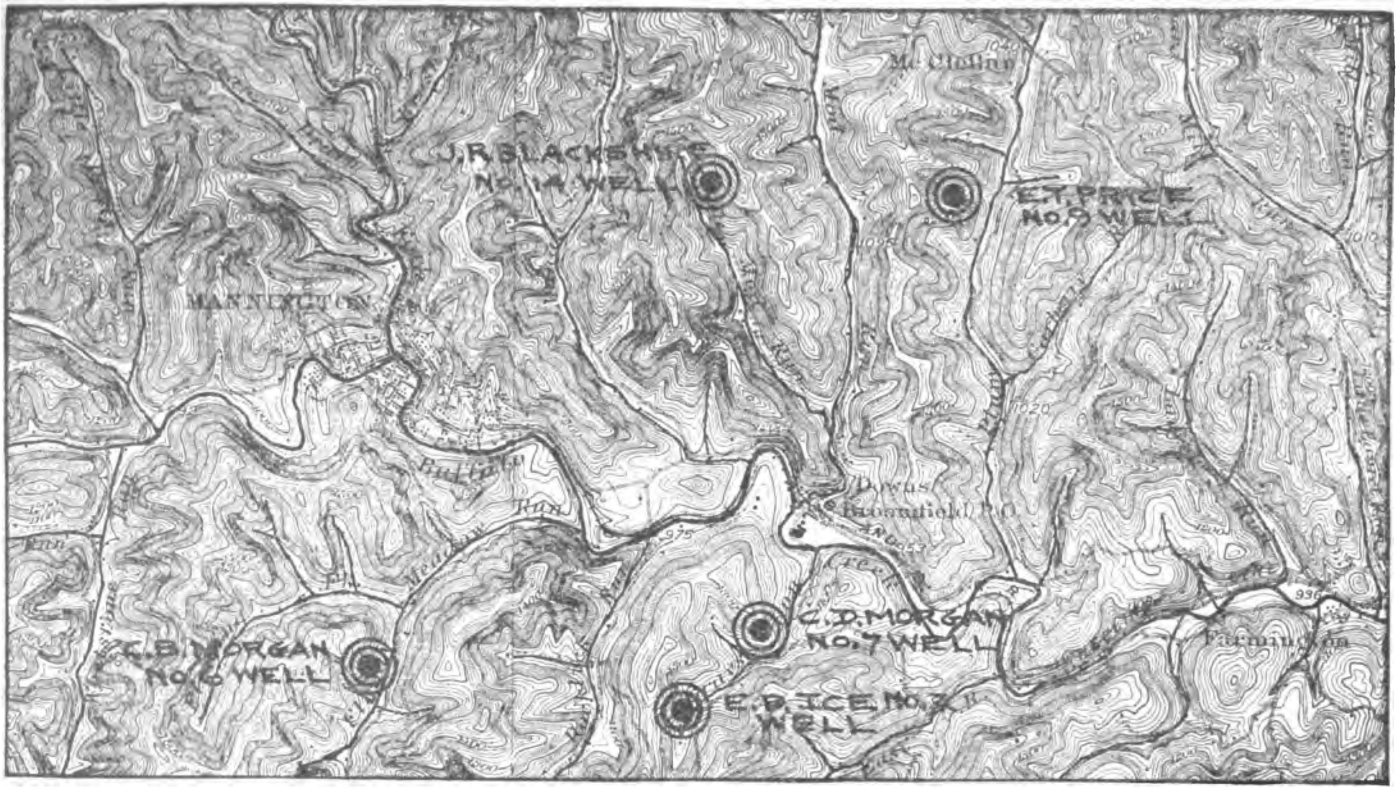

Figure 26.—Map Showing Location of J. R. Blackshire No. 14; C. B. Morgan No. 6; E. D. Ice No. 2; C. D. Morgan No. 7; and E. T. Price No. 9 Wells (Portion of Mannington Quadrangle).

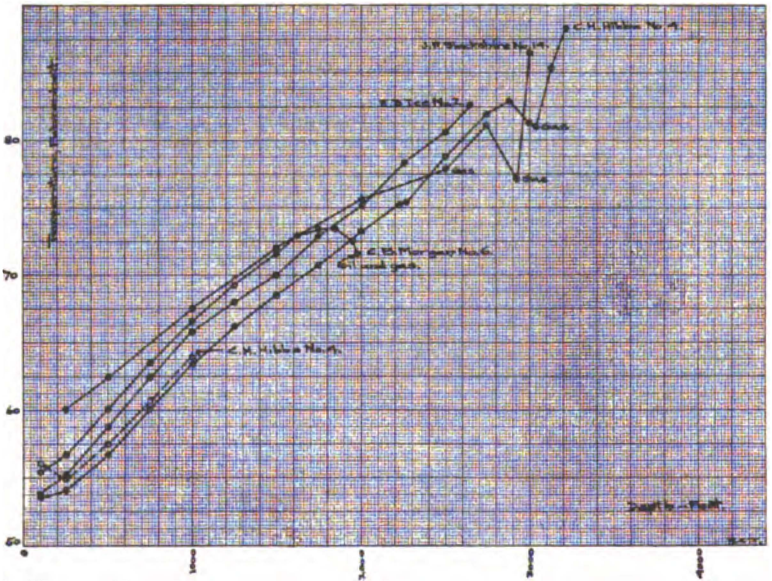

Figure 27.—Depth Temperature Curves, J. R. Blackshire No. 14; C. H. Hibbs No. 4; E. D. Ice No. 2; and C. B. Morgan No. 6 Wells.

Table 1. Temperature measurements in deep well J. R. Blackshire No. 14, South Penn Oil Co. Location near Mannington, W. Va. Mannington Quadrangle.

Depth		Observed Temperature	Mean Temperature		Well Record		Remarks
Meters	Feet	Centigrade	C.	Fahr.			
		15.7			546-551	Sewickley Coal	
76.2	250	15.7	15.6	60.1	647-652	Pittsburgh Coal	Discharge of gas in
		15.5			1080-1106	Little Dunkard Sand	24 hrs.=998790 cu. ft.
					1140-1240	Big Dunkard Sand	
		17.0			1445-1483	First Salt Sand	Discharge at 2560
152.4	500	17.0	16.9	62.4	1575-1635	Second Salt Sand	ft.=431040 cu. ft.
		16.7			1603	Water	
					1926-1938	Little Lime	Discharge at 2940
		16.9			1933-1937	Pencil Cave	ft. 567750 cu. ft.
152.4	500	17.0	16.9	62.4	1937-1998	Big Lime	
		16.7			1998-2125	Big Injun Sand	Oil pumped from
					2090	first pay (show)	depth of 3070 feet.
		19.7			2550-2556	Gantz Sand	
304.8	1000	19.7	19.7	67.5	2556-2643	50-ft. Sand	
		19.6			2560	gas	
					2653-2680	30-ft. Sand	
		22.2			2848	Stray Sand, Gordon	
457.2	1500	22.2	22.2	72.0	2872-2915	Gordon Sand	
		22.2			2922-2969	Fourth Sand	
		22.0			2940	gas	
457.2	1500	22.2	22.2	72.0	3040-3050	Fifth Sand	
		22.3			3048	gas	

Depth		Observed Temperature	Mean Temperature		Well Record	
Meters	Feet	Centigrade	C.	Fahr.		
609.6	2000	24.0 24.3 24.3	24.2	75.6	3070 oil 3124 total depth	
609.6	2000	24.0 24.2 24.2	24.1	75.4		
762.0	2500	25.5 25.5 25.5	25.5	77.9		
762.0	2500	25.3 25.6 25.7	25.5	77.9		
838.2	2750	27.3 27.3 27.3	27.3	81.1		
893.1	2930	25.2 25.0 25.1	25.1	77.2		
893.1	2930	25.0 25.0 25.1	25.0	77.0		
914.4	3000	30.1 30.2 30.2	30.2	86.4		

Table 2. Temperature measurements in deep well C. B. Morgan No. 6, South Penn Oil Co. Location near Mannington, W. Va. Mannington Quadrangle.

Depth		Observed Temperature	Mean Temperature		Well Record	Remarks
Meters	Feet	Centigrade	C.	Fahr.		
30.5	100	13.1 13.0 13.0	13.0	55.4	462-467 Sewickley Coal 560-569 Pittsburgh Coal 1080-1150 Dunkard Sand 1235-1295 Gas Sand 1285 water 1460-1585 Salt Sand 1840-1850 Pencil Cave 1850-1920 Big Lime 1920 Big Injun Sand 1985 gas 1990 first pay oil 2010 total depth	Estimated discharge of gas, 40,000 cu. ft. per day.
76.2	250	13.7 13.7 13.6	13.7	56.7		
152.4	500	15.4 15.7 15.7	15.6	60.1		
228.6	750	17.6 17.5 17.3	17.5	63.5		
304.8	1000	19.1 19.2 19.3	19.2	66.6		

Depth		Observed Temperature	Mean Temperature			
Meters	Feet	Centigrade	C.	Fahr.		
381.0	1250	20.6 20.7 20.8	20.7	69.3		
457.2	1500	22.0 22.0 22.0	22.0	71.6		
495.3	1625	22.6 22.7 22.8	22.7	72.9		
533.4	1750	22.9 23.0 23.0	23.0	73.4		
568.9	1850	23.0 23.0 23.1	23.0	73.4		
594.4	1950	22.6 22.6 22.3	22.5	72.5		
603.5	1980	22.0 22.0 22.1	22.0	71.6		

Table 3. Temperature measurements in deep well E. D. Ice No. 2, South Penn Oil Co. Location near Mannington, W. Va. Mannington Quadrangle.

Depth		Observed Temperature	Mean Temperature		Well Record	Remarks
Meters	Feet	Centigrade	C.	Fahr.		
30.5	100	12.0 12.0 12.2	12.1	53.8	115 Bluff Sand 412 Sewickley Coal 527-532 Pittsburgh Coal 1000-1020 Dunkard Sand 1300-1360 Gas Sand 1420-1530 Salt Sand 1471-1500 water 1640-1760 red rock 1792-1801 Little Lime 1801-1825 lime 1825-1828 Pencil Cave 1828-1908 Big Lime 1908-2027 Big Injun 1995 gas in Big Injun 2453-2495 50-ft. Sand. 2495-2502 slate 2502-2541 sand 2541-2545 slate 2545-2553 sand 2685-2692 sand 2715 Stray Sand 2753 top of Gordon Sand 2779 oil in Gordon Sand 2788 total depth	There was not sufficient gas in this well to be perceptible to the eye. Temperature of oil when taken from bailer, 52° C., 77° F.
76.2	250	12.7 13.0 13.0	12.9	55.2		
152.4	500	14.8 15.0 15.0	14.9	58.8		
228.6	750	16.7 17.0 17.0	16.9	62.4		
304.8	1000	18.7 18.8 18.8	18.8	65.8		
304.8	1000	18.8 18.9 19.0	18.9	66.0		

Depth		Observed Temperature	Mean Temperature	
Meters	Feet	Centigrade	C.	Fahr.
381.0	1250	20.1 20.1 19.9	20.0	68.0
457.2	1500	21.0 21.2 21.2	21.1	70.0
533.4	1750	22.6 22.7 22.8	22.7	72.9
609.6	2000	24.0 24.0 24.0	24.0	75.2
685.8	2250	25.6 25.7 25.8	25.7	78.3
762.0	2500	26.9 27.0 27.0	27.0	80.6
807.7	2650	28.0 28.0 28.2	28.1	82.6

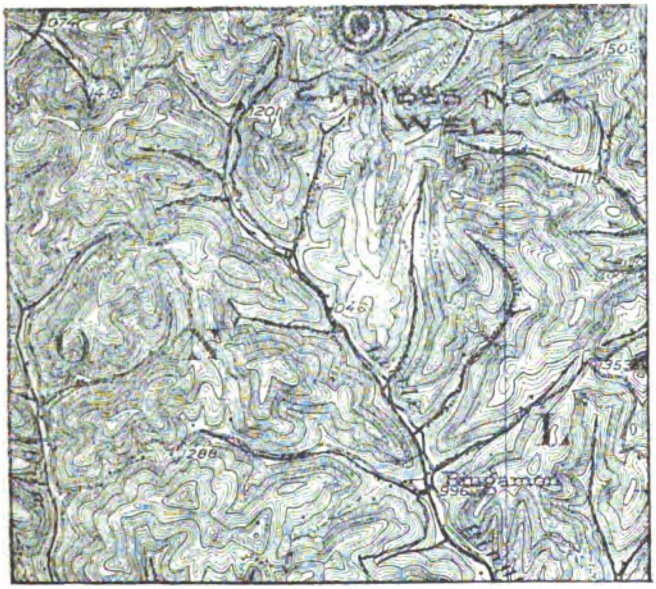

Figure 28.—Map Showing Location of C. H. Hibbs No. 4 Well (Portion of Mannington Quadrangle).

Table 4. Temperature measurements in deep well C. H. Hibbs No. 4, South Penn Oil Co. Location near Mannington, W. Va. Mannington Quadrangle.

Depth		Observed Temperature	Mean Temperature		Well Record.
Meters	Feet	Centigrade	C.	Fahr.	
30.5	100	12.0 12.0 12.0	12.0	53.6	787 Pittsburgh Coal 1200-1245 Little Dunkard 1265-1325 Big Dunkard 1480-1560 Gas Sand 1575-1615 Gas Sand 1630-1710 Salt Sand 2065-2081 Little Lime 2081-2087 Pencil Cave 2087-2190 Big Lime 2190-2262 Big Injun Sand 2218 gas (small flow) 2232 gas (9/10) 2271-2300 Squaw Sand 2275-2280 show oil 2700-2740 50-ft. Sand 2982-2992 Gordon Stray 3002-3022 Gordon Sand 3032-3073 Fourth Sand 3044 gas (small flow) 3170-3176 Fifth Sand 3260 Total depth
76.2	250	12.3 12.3 12.3	12.3	54.1	
152.4	500	13.8 13.8 13.5	13.7	56.7	
152.4	500	13.7 13.7 13.9	13.8	56.8	
228.6	750	15.7 15.7 15.3	15.6	60.1	
304.8	1000	17.5 17.5 17.5	17.5	63.5	
304.8	1000	17.6 17.5 17.3	17.5	63.5	
381.0	1250	19.0 19.0 19.1	19.0	66.2	
457.2	1500	20.4 20.3 20.1	20.3	68.5	
533.4	1750	21.6 21.4 21.4	21.5	70.7	
609.6	2000	22.9 22.8 22.9	22.9	73.2	
680.3	2232	24.0 23.9 24.0	24.0	75.2	
685.8	2250	24.2 24.2 24.0	24.1	75.4	
762.0	2500	26.0 26.0 26.0	26.0	78.8	
762.0	2500	26.0 26.0 26.0	26.0	78.8	

Depth		Observed Temperature	Mean Temperature	
Meters	Feet	Centigrade	C.	Fahr.
838.2	2750	27.7 27.7 27.7	27.7	81.9
876.3	2875	28.3 28.2 28.3	28.3	82.9
914.4	3000	27.5 27.3 27.2	27.4	81.3
927.8	3044	27.3 27.2 27.2	27.2	81.0
955.2	3134	29.7 29.7 29.5	29.6	85.3
983.0	3225	31.4 31.3 31.3	31.3	88.3

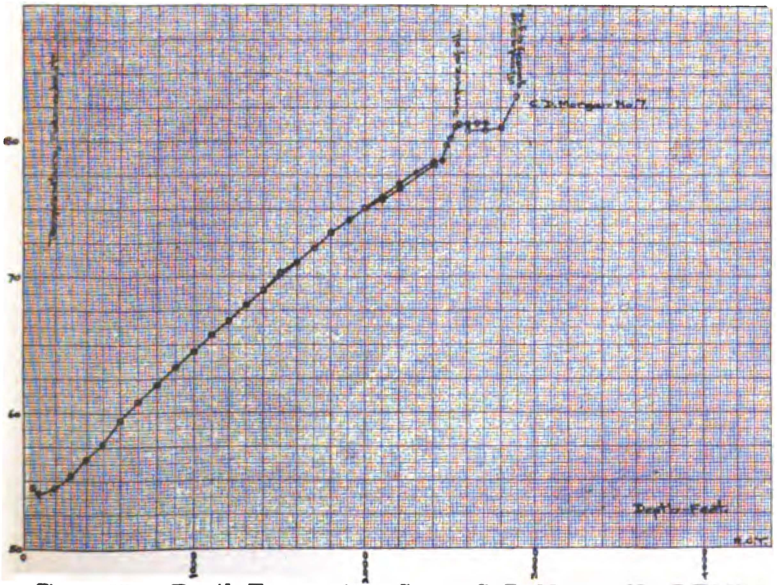

Figure 29.— Depth Temperature Curve, C. D. Morgan No. 7 Well.

Table 5. Temperature measurements in deep well C. D. Morgan No. 7, South Penn Oil Co. Location near Mannington, W. Va. Mannington Quadrangle.

Depth		Temperature		Well Record	Remarks
Meters	Feet	Centigrade	Fahrenheit		
18.3	60	12.43	54.37		
30.5	100	12.32	54.18		
61.0	200	12.51	54.52		
91.4	300	12.97	55.35	530 Sewickley Coal	This well discharges a small quantity of gas which may have an entrance at or near the points 2875 and 2888. Oil in considerable quantity is pumped from the same depths. Surface of oil at depth of about 2400 feet.
121.9	400	13.54	56.37	641 Pittsburgh Coal	
152.4	500	14.29	57.72	1125-1235 Dunkard Sand	
182.9	600	15.20	59.36	1365-1430 Gas Sand	
213.4	700	16.06	60.91	1520-1550 First Salt Sand	
243.8	800	16.68	62.02	1570-1680 Second Salt Sand	
274.3	900	17.45	63.41	1915-1925 Little Lime	
304.8	1000	18.12	64.62	1935-1996 Big Lime	
335.3	1100	18.73	65.71	1996-2110 Big Injun	
365.8	1200	19.30	66.74	1996- gas	
396.2	1300	19.91	67.84	2090 gas	
426.1	1400	20.55	68.99	2550-2640 50-ft. Sand	
457.2	1500	21.24	70.23	2830-2850 Stray Sand	
487.7	1600	21.69	71.04	2861 Gordon Sand	
518.2	1700	22.24	72.03	2875 oil	
548.6	1800	22.79	73.02	2888 oil	
579.1	1900	23.31	73.96	2901 Total depth	
609.6	2000	23.89	75.00		
640.1	2100	24.33	75.79		
670.6	2200	24.93	76.87		
701.0	2300	25.32	77.58		
731.5	2400	25.73	78.31		
746.8	2450	25.92	78.66		
754.4	2475	26.43	79.57		
762.0	2500	26.74	80.13		
769.6	2525	27.21	80.98		
777.2	2550	27.29	81.12		
792.5	2600	27.31	81.16		
807.7	2650	27.32	81.18		
823.0	2700	27.33	81.19		
					Reading taken after well had been bailed.
487.7	1600	21.67	71.01		
609.6	2000	23.87	74.97		
640.1	2100	24.21	75.58		
670.6	2200	24.67	76.41		
701.0	2300	25.25	77.45		
731.5	2400	25.66	78.19		
762.0	2500	26.67	80.01		
792.5	2600	27.04	80.67		
823.0	2700	27.05	80.69		
853.4	2800	27.21	80.98		
876.3	2875	28.39	83.10		
880.3	2888	28.44	83.19		

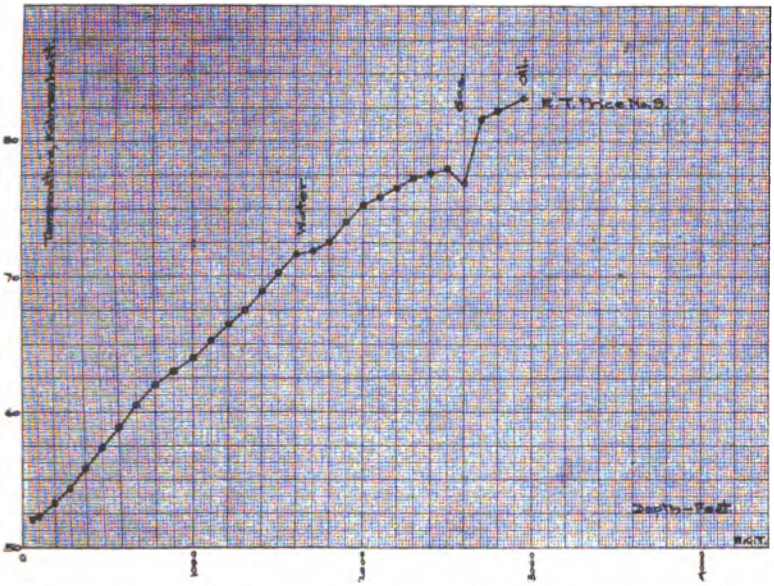

Figure 30—Depth Temperature Curve, E. T. Price No. 9 Well.

Table 6. Temperature measurements in deep well E. T. Price No. 9, South Penn Oil Co. Location near Mannington, W. Va. Mannington Quadrangle.

Depth		Temperature		Well Record	Remarks
Meters	Feet	Centigrade	Fahrenheit		
18.3	60	11.16	52.09	280-350 Bluff Sand	This well contains a small quantity of oil and gas.
30.5	100	11.24	52.23	595-600 Sewickley Coal	
61.0	200	11.84	53.81	707-715 Pittsburgh Coal	
91.4	300	12.40	54.32	1243-1260 Big Dunkard Sand	
121.9	400	13.26	55.87	1425-1447 Gas Sand	
152.4	500	14.06	57.31	1505-1540 First Salt Sand	
182.9	600	14.95	58.91	1615-1750 Second Salt Sand	
213.4	700	15.84	60.51	1625 water	
243.8	800	16.59	61.86	1964-1976 Little Lime	
274.3	900	17.26	63.07	1976-1980 Pencil Cave	
304.8	1000	17.68	63.82	1980-2058 Big Lime	
335.3	1100	18.48	65.17	2058-2175 Big Injun	
365.8	1200	19.14	66.45	2085 show of gas	
396.2	1300	19.76	67.57	2177-2212 Squaw Sand	
426.7	1400	20.46	68.83	2588-2604 Gantz Sand	
457.2	1500	21.28	70.30	2630-2682 50-ft. Sand	
487.7	1600	21.93	71.47	2770-2810 30-ft. Sand	
518.2	1700	22.01	71.62	2937- Gordon Sand	
548.6	1800	22.51	72.52	2960- oil	
579.1	1900	23.38	74.08	2972 Total depth	
609.6	2000	24.01	75.22		
640.1	2100	24.38	75.88		
670.6	2200	24.71	76.48		
701.0	2300	25.18	77.32		
731.5	2400	25.33	77.59		
762.0	2500	25.33	77.95		
792.5	2600	24.99	76.98		
823.0	2700	27.63	81.73		
853.4	2800	27.93	82.27		
731.5	2400	25.29	77.52		Reading taken after well had been bailed.
762.0	2500	25.58	78.04		
902.2	2960	28.41	83.14		

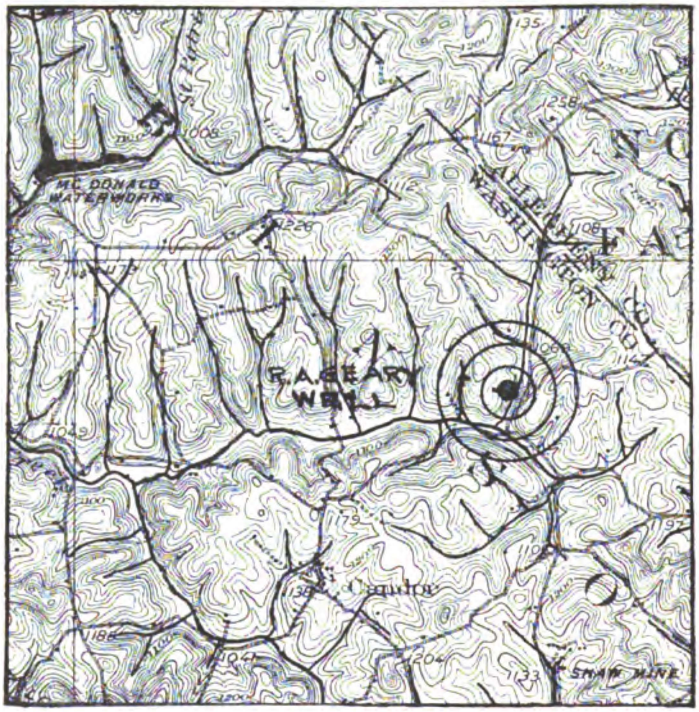

Figure 31.—Map Showing Location of R. A. Geary No. 770 Well (Portion of Burgettstown Quadrangle).

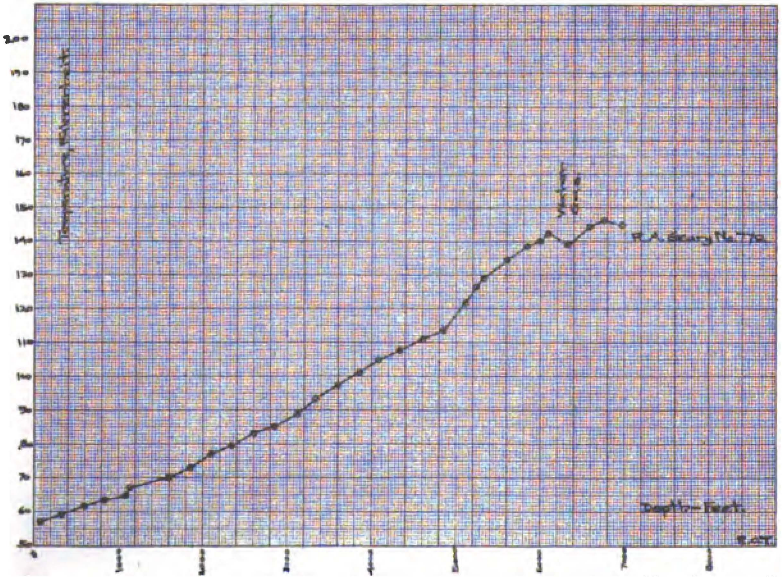

Figure 32.—Depth Temperature Curve, R. A. Geary No. 770 Well.

Table 7. Temperature measurements in Well No. 770. The Peoples Natural Gas Co. Location 4 miles northwest of McDonald, Pa. Burgettstown Quadrangle. Farm of R. A. Geary.

Depth		Temperature		Remarks
Meters	Feet	Centigrade	Fahrenheit	
30.5	100	13.9	57.0	Observations were made Nov. 16-20, 1914
106.7	350	15.1	59.2	
182.9	600	16.2	61.2	Inside diam. of pipe 3.5 inches. Length of pipe 6500 ft.
259.1	850	17.5	63.5	
335.3	1100	18.0	64.4	
411.5	1350	19.2	66.6	Reading at 6000 ft. taken Nov. 30, 1912, by Dr. John Johnston.
487.7	1600	20.8	69.4	
563.9	1850	22.3	72.1	
640.1	2100	24.6	76.3	Record published on pp. xxviii-xxix.
716.3	2350	26.1	79.0	
792.5	2600	28.0	82.4	
868.7	2850	29.3	84.7	
944.9	3100	31.2	88.2	
1021.1	3350	33.6	92.5	
1097.3	3600	36.0	96.8	
1173.5	3850	38.2	100.8	
1249.7	4100	40.2	104.4	
1325.9	4350	41.7	107.1	
1402.1	4600	43.6	110.5	
1478.3	4850	45.1	113.2	
1554.5	5100	49.5	121.1	
1592.6	5225	51.8	125.2	
1630.7	5350	53.2	127.8	
1706.9	5600	56.3	133.3	
1783.1	5850	58.9	138.0	
1828.8	6000	60.0	140.0	
1859.3	6100	60.7	141.3	
1935.5	6350	59.3	138.7	
2011.7	6600	62.3	144.1	
2065.0	6775	63.2	145.8	
2126.0	6975	62.7	144.9	Thermometers in water.

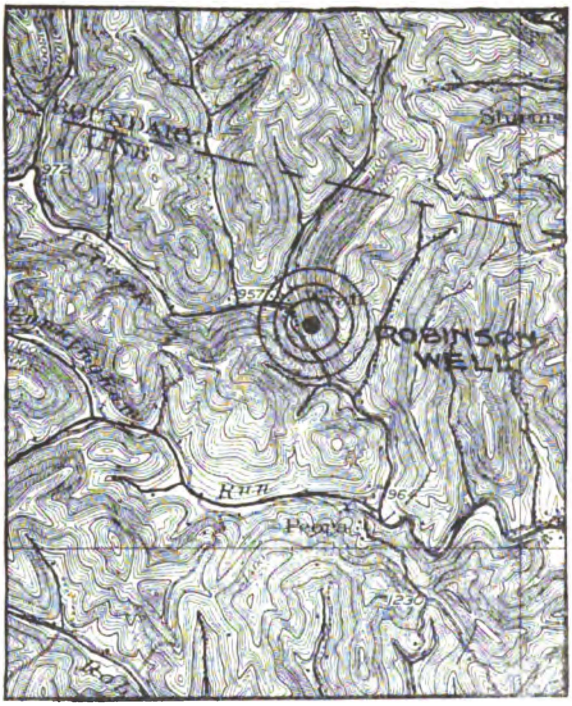

Figure 33.—Map Showing Location of E. Robinson No. 4291 Well (Portion of Clarksburg Quadrangle).

Table 8. Temperature measurements and well record in Well No. 4291, Hope Natural Gas Co. Location, Wyatt, five miles northwest of Shinnston, W. Va. Clarksburg Quadrangle. Farm of E. Robinson.

Depth		Temperature		Well Record	Remarks
Meters	Feet	Centigrade	Fahrenheit		
30.5	100	12.49	54.5	141-149 Pittsburgh Coal	Gas cased off.
				510-542 Sand	
61.0	200	13.07	55.5	550-580 Little Dunkard	Pipe-line opened in the morning before the readings were taken.
				515 Water	
91.4	300	13.49	56.3	602-672 Big Dunkard	
				780-785 Gas Sand	
121.9	400	14.17	57.5	902-973 First Salt Sand	
				1003-1018 Second Salt Sand	A small discharge of gas at 1610 feet.
152.4	500	14.96	58.9	1048-1196 Third Salt Sand	
				1220-1240 Maxton Sand	
182.9	600	15.50	59.9	1428-1440 Little Lime	
				1440-1445 Pencil Cave	
213.4	700	16.10	61.0	1445-1510 Big Lime	
				1510-1631 Big Injun Sand	
243.8	800	16.69	62.0	1610 gas	
				1986-2010 Gantz	
274.3	900	17.19	62.9	2050-2116 50-ft.	

Depth		Temperature		Well Record	Remarks
Meters	Feet	Centigrade	Fahrenheit		
				2116-2160 30-ft.	
304.8	1000	17.88	64.2	2205-2245 Gordon Stray	
				2295-2375 Gordon Sand	
335.3	1100	18.33	65.0	2502-2541 Fifth Sand	
				2882-2888 Sand	
365.8	1200	18.68	65.6	3325-3370 hard lime	
				3370-3396 black slate	
396.2	1300	19.18	66.5	3396-3398 hard lime	
				3398 gas	
426.7	1400	18.81	67.7	3398-3695 slate and lime	
				3695-3755 hard lime	
457.2	1500	20.24	68.4	3755-3850 slate and lime	
				3850-4000 lime	
487.7	1600	19.98	68.0	4000-4040 light slate	
				4040-4050 lime	
518.2	1700	21.50	70.7	4050-4060 dark lime	
				4060-4150 lime	
548.6	1800	22.19	71.9	4150-4210 white slate	
				4210-4275 hard lime.	
579.1	1900	22.71	72.9	4275-4390 soft lime	
				4390-4430 hard lime	
609.6	2000	23.38	74.1	4430-4455 slate	
				4455-4500 lime	
				4500-4550 lime	
				4550-4640 slate	
				4640-4645 hard lime	
				4655-4705 hard white lime	
				4705-4800 white lime	
				4800-4908 slate and lime	
				4908-4920 black lime	

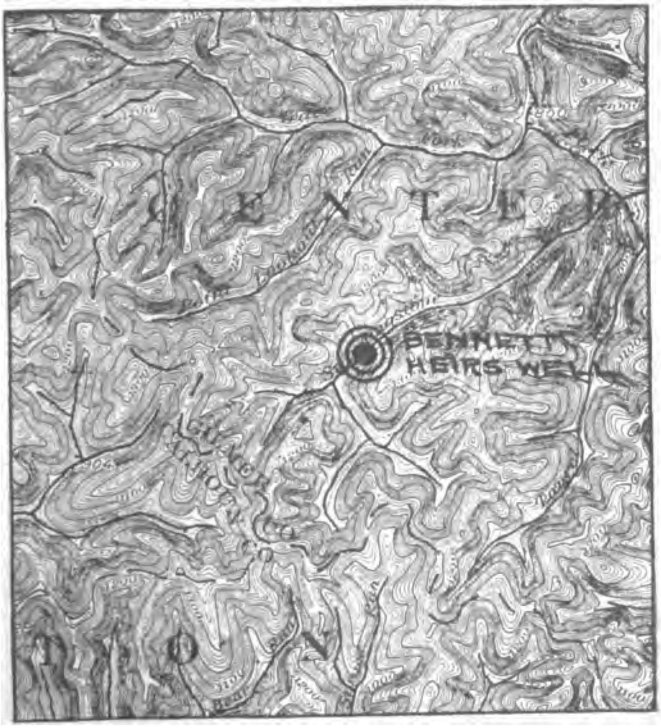

Figure 34.—Map Showing Location of Bennett Heirs No. 4262 Well (Portion of Arnoldsburg Quadrangle).

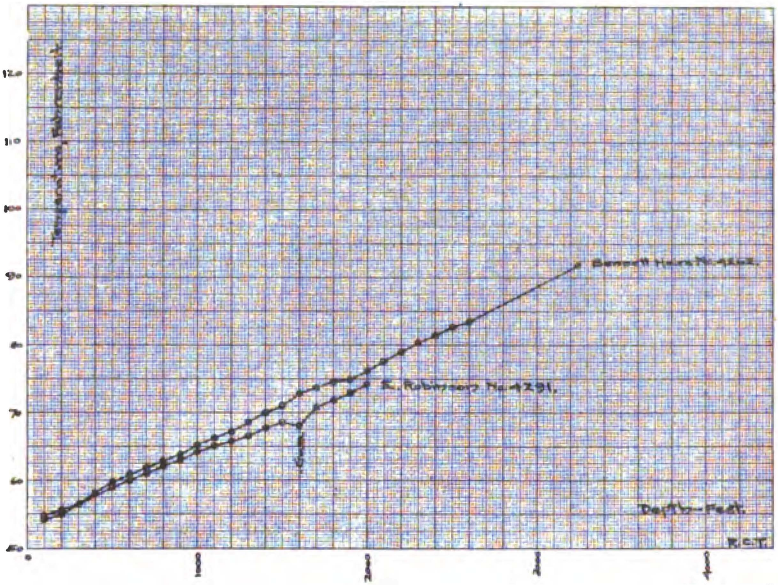

Figure 35.—Depth Temperature Curves, E. Robinson No. 4291 and Bennett Heirs No. 4262 Wells.

Table 9. Temperature measurements and well record in Well No. 4262, Hope Natural Gas Co. Location twenty-two miles east of Spencer, W. Va. Arnoldsburg Quadrangle. Farm of Bennett Heirs.

Depth		Temperature		Well Record	Remarks
Meters	Feet	Centigrade	Fahrenheit		
30.5	100	12.26	54.1	653-729 Little Dunkard	Diameter of casing 6⅝ in.
61.0	200	12.79	55.0	810-840 Dunkard	
91.4	300	13.49	56.8	867 show of gas	
121.9	400	14.34	57.8	886-937 Sand	Length of casing 1827.5 ft.
152.4	500	15.22	59.4	905 show of salt water	
182.9	600	15.93	60.7	947-959 Gas Sand	
213.4	700	16.48	61.7	959-965 Coal	Depth, Apr. 17. 1917, 3403 ft.
243.8	800	17.04	62.7	1040-1065 Sand	
274.3	900	17.56	63.6	1080 show of water	
304.8	1000	18.41	65.1	1088-1123 First Salt	
335.3	1100	18.91	66.0	1140-1180 Sand	
365.8	1200	19.46	67.0	1267-1285 Second Salt	
396.2	1300	20.27	68.5	1313-1322 Sand	
426.7	1400	21.07	69.9	1398-1475 Maxton	
457.2	1500	21.62	70.9	1400 show of oil	
487.7	1600	22.54	72.6	1545-1565 Little Lime	
518.2	1700	23.03	73.5	1585-1589 Coal	
548.6	1800	23.59	74.5	1656 show of oil	
579.1	1900	23.86	74.9	1733-1770 Big Lime	
609.6	2000	24.56	76.2	1770-1781 Pencil Cave	
640.1	2100	25.30	77.5	1781-1815 Lime	
670.6	2200	26.13	79.0	1815-1910 Big Injun	
701.0	2300	26.83	80.3	1900 Gas	
731.5	2400	27.45	81.4		
762.0	2500	28.12	82.6		
792.5	2600	28.56	83.4		
990.6	3250	33.8	91.9		

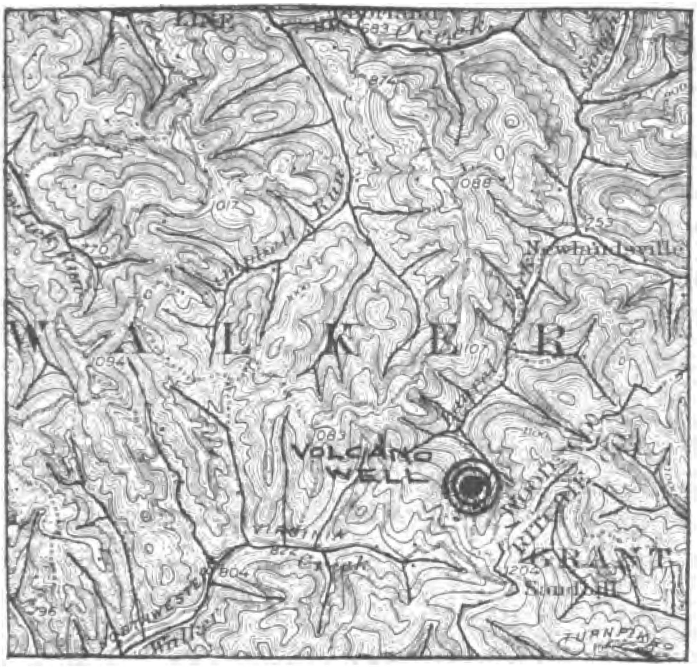

Figure 36.—Map Showing Location of Volcanic Oil and Coal Company No. 4670 Well (Portion of Marietta Quadrangle).

Table 10. Temperature measurements in Well No. 4670, Hope Natural Gas Co. Location near Sandhill, 4 miles north of Volcano Junction, W. Va. Marietta Quadrangle. Land of Volcanic Oil and Coal Co.

Depth		Temperature		Thermometer	Date of Reading	Remarks
Meters	Feet	Centigrade	Fahrenheit			
30.5	100	12.8	54.2	Mercury........	Jan. 31, 1918	Temperature of water in bailer on Apr. 7, 1917, 34.5° C., 94.1° F. Depth 3642 ft. Total depth Feb. 23, 1918, 4859 ft. Total discharge of gas at 4527 ft., exceeds 500,000 cu. ft. per day. Record published on page lii.
61.0	200	12.8	55.0	Mercury........	Feb. 28, 1918	
91.4	300	13.25	55.9	Electric.........	April 10, 1917	
121.9	400	13.57	56.4	Electric.........	April 10, 1917	
152.4	500	13.99	57.2	Electric.........	April 10, 1917	
182.9	600	14.14	57.5	Electric.........	April 10, 1917	
213.4	700	14.78	58.6	Electric.........	April 10, 1917	
243.8	800	15.35	59.6	Electric.........	April 10, 1917	
274.3	900	16.15	61.1	Electric.........	April 10, 1917	
304.8	1000	17.09	62.8	Electric.........	April 10, 1917	
381.0	1250	18.43	65.2	Electric.........	April 10, 1917	
457.2	1500	19.99	68.0	Electric.........	April, 10, 1917	
533.4	1750	21.6	70.9	Mercury........	Jan. 31, 1918	
609.6	2000	23.79	74.8	Electric.........	April 10, 1917	
685.8	2250	26.2	79.1	Mercury........	Jan. 31, 1918	
762.0	2500	28.14	82.7	Electric.........	April 10, 1917	
838.2	2750	30.1	86.2	Mercury........	Jan. 31, 1918	
914.4	3000	32.81	91.1	Electric.........	April 10, 1917	
990.6	3250	35.0	95.0	Mercury........	Jan. 31, 1918	
1066.8	3500	37.2	99.0	Mercury........	April 10, 1917	
1143.0	3750	39.8	103.7	Mercury........	Jan. 31, 1918	
1219.2	4000	42.7	108.8	Mercury........	Jan. 31, 1918	
1219.2	4000	42.3	108.2	Mercury........	Feb. 23, 1918	
1249.7	4100	43.7	110.7	Mercury........	Jan. 31, 1918	
1295.4	4250	45.1	113.1	Mercury........	Feb. 23, 1918	

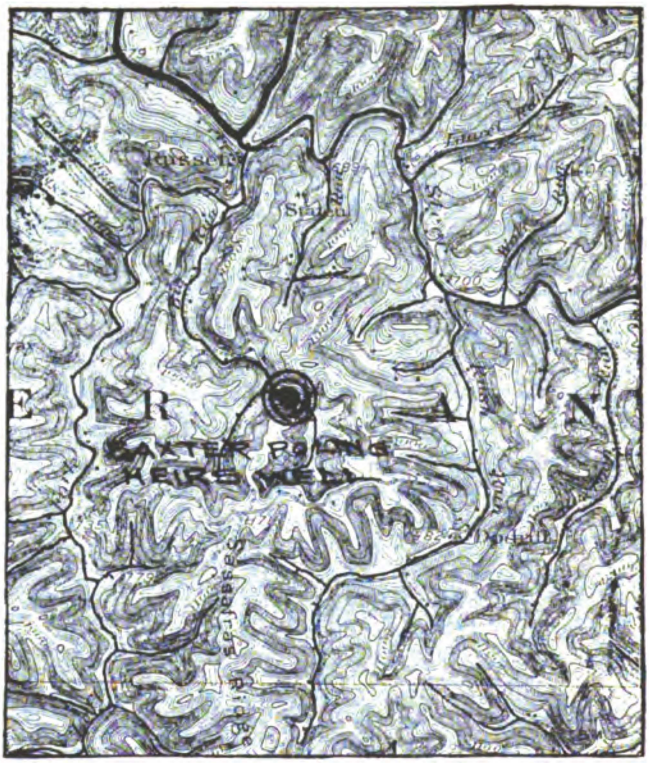

Figure 37.—Map Showing Location of Baxter Poling Heirs No. 4623 Well (Portion of Arnoldsburg Quadrangle).

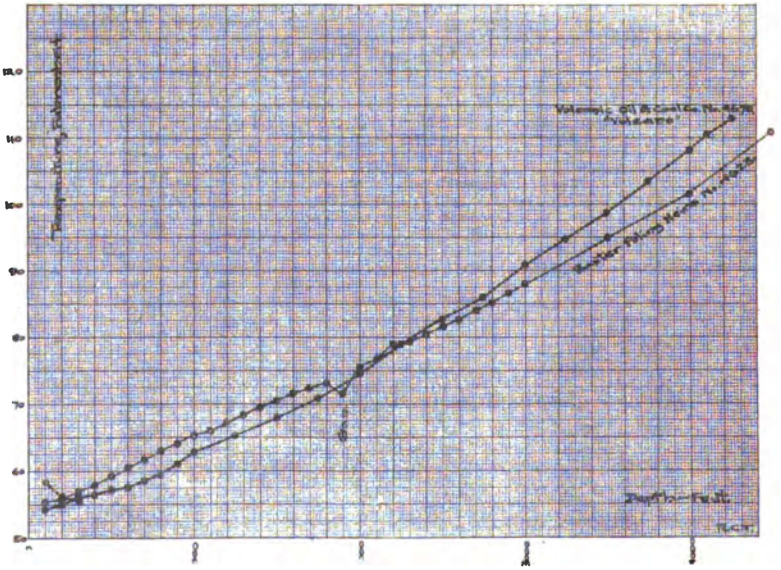

Figure 38.—Depth Temperature Curves, Volcanic Oil & Coal Company No. 4670 and Baxter Poling Heirs No. 4623 Wells.

Table 11. Temperature measurements and well record of Well No. 4623, Hope Natural Gas. Co.

Location, five miles southeast of Grantsville, W. Va. Arnoldsburg Quadrangle. Farm of Baxter Poling Heirs.

Depth		Temperature		Well Record	Remarks
Meters	Feet	Centigrade	Fahrenheit		
30.5	100	12.95	55.8	832-847 Big Dunkard	Diameter of casing 6⅝ in.
61.0	200	13.21	55.8	1005-1148 Gas Sand	
91.4	300	13.76	56.8	1180-1218 First Salt	
121.9	400	14.38	57.9	1280-1370 Second Salt	Length of casing 1873.5 ft.
152.4	500	15.10	59.2	1590-1626 Second Salt	
182.9	600	15.80	60.4	1610 show of oil	
213.4	700	16.47	61.6	1658-1768 Maxton	Total depth Apr. 21, 1917, 4610 ft.
243.8	800	17.17	62.9	1735 oil and water	
274.3	900	17.81	64.1	1778-1797 Little Lime	
304.8	1000	18.43	65.2	1797-1828 Pencil Cave	
335.3	1100	18.85	65.9	1828-1870 Big Lime	
365.8	1200	19.57	67.2	1870-1965 Big Injun	
396.2	1300	20.14	68.3	1938 gas	
426.7	1400	20.82	69.5	1953-1959 oil and gas	
457.2	1500	21.29	70.3	4500 black slate	
487.7	1600	22.08	71.7	4530 limestone	
518.2	1700	22.50	72.5	4550 white slate	
548.6	1800	22.89	73.2	4580-4610 white lime	
579.1	1900	22.02	71.6		
609.6	2000	24.11	75.4		
640.1	2100	24.94	76.9		
670.6	2200	25.59	78.1		
701.0	2300	26.32	79.4		
731.5	2400	26.93	80.5		
762.0	2500	27.64	81.8		
792.5	2600	28.26	82.9		
823.0	2700	29.02	84.2		
853.4	2800	29.67	85.4		
883.9	2900	30.43	86.8		
914.4	3000	31.16	88.1		
1066.8	3500	35.1	95.2		Two readings.
1219.2	4000	38.8	101.8		
1371.6	4500	43.8	110.8		Three readings.

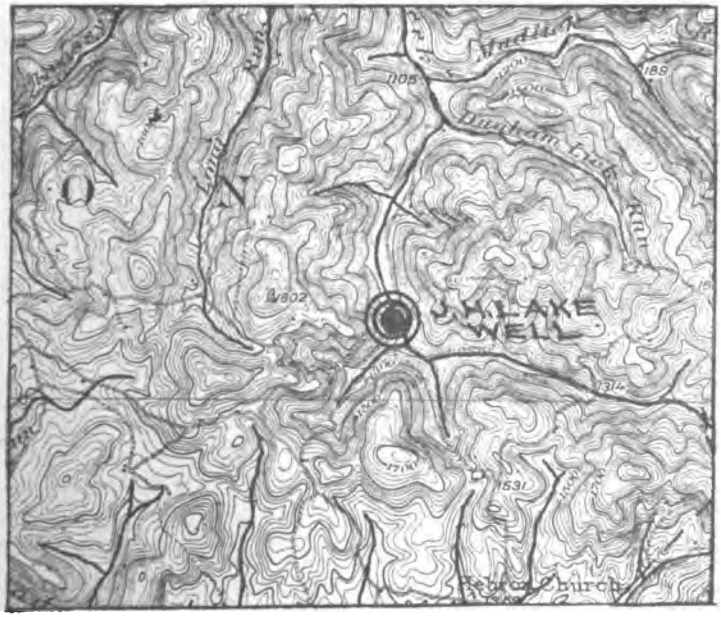

Figure 39.—Map Showing Location of J. H. Lake (Jacob Rogers) No. 4304 Well (Portion of Fairmont Quadrangle).

Table 12. Temperature measurements and well record in Well No. 4304, Hope Natural Gas Co.

Location, four miles northeast of Valley Falls, W. Va. Fairmont Quadrangle. Farm of J. H. Lake (Jacob Rogers).

Depth		Temperature		Well Record	Remarks
Meters	Feet	Centigrade	Fahrenheit		
30.5	100	12.07	53.7	820 Gas. 848-870 Squaw	Diameter of casing, 6 in.
61.0	200	13.20	55.8	1000-1025 Berea	
91.4	300	14.17	57.5	1115-1135 Gantz	
121.9	400	14.88	58.8	1225-1270 50-ft.	Total depth, Apr. 4, 1917, 5005 ft
152.4	500	15.49	59.9	1273-1340 30-ft.	
182.9	600	16.12	61.0	1448-1470 Gordon Stray	
213.4	700	16.75	62.2	1474-1495 Gordon	Temperature of water in bailer on Mar. 31, 1917, 57° C., 135° F.
243.8	800	17.12	62.8	1670-1680 Sand	
274.3	900	17.98	64.4	1695-1705 Fourth	
304.8	1000	18.66	65.6	1715-1742 Sand	
335.3	1100	19.36	66.8	1755-1810 Fifth	
365.8	1200	20.06	68.1	1890-1950 Lime	
396.2	1300	20.66	69.2	2045-2050 Bayard	
426.7	1400	21.42	70.6	2115-2125 Lime	
457.2	1500	22.11	71.8	2625-2645 sand	
487.7	1600	22.86	73.1	3750-3835 lime and slate	
518.2	1700	23.49	74.3	3835-3845 sand	
548.6	1800	24.06	75.3	3845-3885 lime and slate	
579.1	1900	24.86	76.7	3885-3900 sand	
609.6	2000	25.80	78.4	3900-4050 lime and slate	
685.8	2250	28.0	82.4	4050-4060 sand	
762.0	2500	30.0	86.0	4060-4110 lime and slate	
838.2	2750	31.8	89.2	4110-4120 sand	
914.4	3000	32.5	90.5	4120-4130 slate	Too low.
990.6	3250	34.2	93.6	4130-4135 sand	Too low.
1066.8	3500	35.2	95.4	4135-4300 lime and slate	Too low.
1143.0	3750	38.3	100.9	4300-4305 sand	
1219.2	4000	40.3	104.5	4305-4475 lime and slate	
1295.4	4250	41.1	106.0	4475-4480 sand	Too low.
1371.6	4500	44.1	111.4	4480-4645 lime and slate	
1447.8	4750	46.8	116.2	4645-4655 sand	
1524.0	5000	49.3	120.7	4655-4750 lime and slate	
1600.2	5250	52.3	126.1	4750-4760 sand	
1645.9	5400	54.0	129.2	4760-5505 lime and slate	

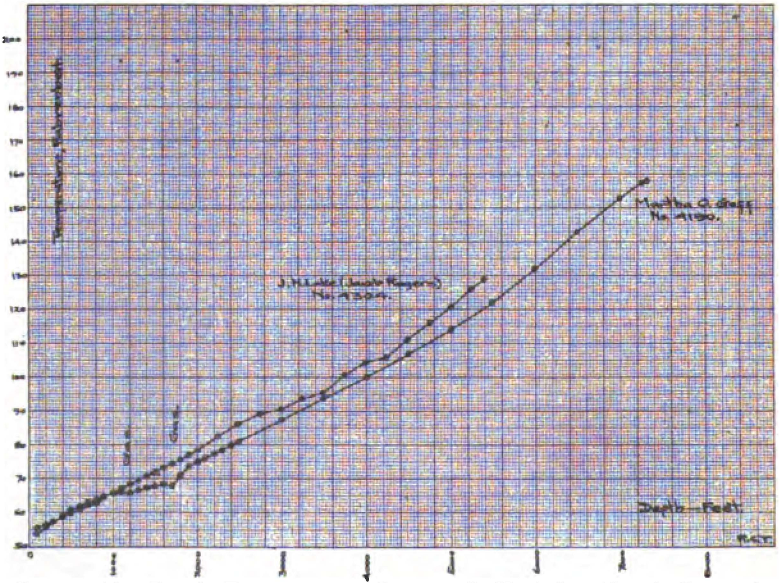

Figure 40.—Depth Temperature Curves, J. H. Lake (Jacob Rogers) No. 4304 and Martha O. Goff No. 4190 Wells.

Table 13. Temperature measurements in Well No. 4190, Hope Natural Gas Co.

Location, four miles northeast of Bridgeport, W. Va. Fairmont Quadrangle. Farm of M. O. Goff.

Depth		Temperature		Remarks
Meters	Feet	Centigrade	Fahrenheit	
30.5	100	13.11	55.6	13-in. Casing, 0-217 ft.
61.0	200	13.51	56.8	
91.4	300	14.15	57.5	10-in. Casing, 0-1238 ft.
121.9	400	14.97	58.8	
152.4	500	15.67	60.2	8-in. Casing, 0-2307 ft.
182.9	600	16.42	61.6	
213.4	700	16.92	62.5	6-in. Casing, 6405-7071 ft.
243.8	800	17.49	63.5	
274.3	900	18.07	64.5	Record published on pp. lxvi-lxviii.
304.8	1000	18.51	65.3	
335.3	1100	18.76	65.8	Total depth, 7386 feet
365.8	1200	18.62	65.5	
396.2	1300	19.18	66.5	
426.7	1400	19.57	67.2	
457.2	1500	19.87	67.8	
487.7	1600	20.01	68.0	
518.2	1700	19.89	67.8	
548.6	1800	21.53	70.8	
579.1	1900	23.13	73.6	
609.6	2000	23.84	74.9	
640.1	2100	24.52	76.1	
670.6	2200	25.19	77.3	
701.0	2300	25.72	78.3	
731.5	2400	26.58	79.8	
762.0	2500	27.2	81.0	
914.4	3000	30.9	87.6	
1066.8	3500	34.3	93.8	
1219.2	4000	37.8	100.0	
1371.6	4500	41.8	107.2	
1524.0	5000	45.7	114.2	
1676.4	5500	50.2	122.3	
1828.8	6000	55.6	132.1	
1981.2	6500	61.8	143.2	
2133.6	7000	67.3	153.2	
2209.8	7250	69.8	157.7	Reading at 7810 feet is about 0.5° F. too low
2228.1	7310	70.2	158.3	

ERRATA.

Page 1, after line 1, insert "Chapter I".

Page 61, line 15 from top, for "Lewis", read "Randolph",

Page 69, line 11 from bottom, after "Cedar Grove" add "Coal."

Page 81, line 22 from top, for "blossim", read "blossom".

Page 85, line 2 from bottom, for "7250", read "7563".

Page 85, bottom line, for "2900", read "3397".

Page 127, line 22 from bottom, for "429 4'"", read "465 4'"", and insert below line 21 from bottom.

Page 132, line 6 from bottom, for Pickens 'A'," read "Alma."

Page 143, line 3 from bottom, change "Campbell Creek" to "Cedar Grove."

Page 143, line 3 from bottom, change "Powellton" to "Alma."

Page 144, line 4 from top, change "Eagle" to "Campbell Creek."

Page 207, line 16 from bottom, for "elevtaion", read "elevation".

Page 702, line 13, from bottom, for "low," read "high."

PART I.

History and Physiography.

HISTORICAL AND INDUSTRIAL DEVELOPMENT.

LOCATION.

Barbour, Upshur, and the coal-bearing area of Randolph County west of the Laurel Ridge and Rich Mountain and north of Elk River, comprise the area treated in this report. These areas are situated in the eastern central part of West Virginia, being included between the parallels of 39° 11′ and 38° 30′ North Latitude, and 79° 48′ and 80° 25′ West Longitude from Greenwich. They lie within the watersheds of the Tygart Valley, Buckhannon, West Fork, Little Kanawha, and Elk Rivers, the first three being tributary to the Monongahela, while the Little Kanawha flows into the Ohio direct and the Elk waters reach the same stream through the Great Kanawha, all of them being part of the Ohio River drainage basin. Barbour, the most northern of the three counties, is bounded on the north by Taylor and Preston; on the east by Preston, Tucker and Randolph; on the south by Randolph and Upshur; and on the west by Upshur and Harrison Counties. Upshur, the most western of the three, is bounded on the north by Harrison and Barbour; on the east by Barbour and Randolph; on the south by Randolph and Webster; and on the west by Lewis. Randolph, the most southern of the three, is bounded on the north by Upshur, Barbour, and Tucker; on the east by Tucker, Grant, Pendleton, and Pocahontas; on the south by Pendleton, Pocahontas, and Webster; and on the west by Webster, Upshur, and Barbour. The portion of Randolph described does not include all its coal-bearing land but only that part contiguous to Upshur and Barbour, this latter part being separated from the Cheat River Coal Basin by an immense structural arch that has pushed the coal measures upward to such a great height that they have been completely eroded from its crest. As here outlined, this region comprises only about one-fourth the total area of this great county, which altogether contains more than a thousand square miles, being the largest in the State. The geographic position of these three counties may be observed in detail from Figures 1 and 2 in this volume and from Maps I and II, enclosed in a separate atlas but accompanying this report.

TRANSPORTATION.

Water Ways.

Little attention has been paid to the development of water transportation, the nearest slack-water being that in the upper pool of the Monongahela River at Fairmont, distant 30 miles from the northern edge of Barbour County. The volume of water flowing down the Tygart Valley River from the mouth of the Buckhannon at Tygart Junction, through Barbour to its mouth at Fairmont, would perhaps be sufficient to provide slack-water service, but the fall of 9 feet per mile between these two points would require the building of not less than 40 dams in a total distance of 51 miles which would be prohibitive.

Local water transportation has existed for ten years or more on the Buckhannon River between Buckhannon and Hampton, made possible by the presence of the Farnsworth mill dam at Buckhannon, small steam or gasoline boats being used for hauling sand which is dredged from the river bed at numerous points between the two towns.

Steam Railroads.

Grafton and Belington Railroad.—The Grafton and Belington Railroad, operated by the Baltimore and Ohio Railroad Company, extending from Grafton, Taylor County, southward along the east bank of the Tygart Valley River to Belington, 41.3 miles, of which 32.5 miles are in Barbour, was chartered in April, 1881, as a narrow gauge line under the name of the Grafton and Greenbrier Railroad, being opened for traffic between Grafton and Philippi in January, 1884. It was purchased by the Baltimore and Ohio at foreclosure in 1892, being reorganized as the Grafton and Belington Railroad, and was extended to Belington and changed to standard gauge May 1, 1892, according to C. W. Woolford, Secretary of the Baltimore and Ohio Railroad.

Berryburg Branch, G. & B. R. R.—The Berryburg Branch of the Grafton and Belington Railroad, extending from Berryburg Junction, on the Grafton and Belington Railroad, westward 4.3 miles to the coal mines at Berryburg, was completed in 1900, and is equipped for both freight and passenger service.

Point Pleasant, Buckhannon and Tygart Valley Railroad.—The Point Pleasant, Buckhannon and Tygart Valley Railroad, operated by the Baltimore and Ohio R. R. Co., extending from Tygart Junction on the Grafton and Belington Branch southwestward 16.6 miles to Buckhannon, where it meets the Pickens Branch of the B. & O., was built from Tygart Junction to Century Junction in 1900, and completed from Century Junction to Buckhannon in October, 1904.

Burnersville Branch, P. Pl., B. and T. V. R. R.—The **Burnersville** Branch of the Pt. Pleasant, Buckhannon and Tygart Valley Railroad as now classified, extends from Century Junction westward, 4.8 miles, to the coal mines at Century, and gives both freight and passenger service, having been completed in 1901. As originally begun in 1900, it tapped the Grafton and Belington R. R. at Tygart Junction, 4.1 miles farther north, but this latter portion of the line is now considered a part of the main line of the Point Pleasant, Buckhannon and Tygart Valley Railroad.

Pickens Branch, B. & O. R. R.—The Pickens Branch of the Baltimore and Ohio Railroad, extending from Weston, Lewis County, through Upshur to Pickens in Randolph, 49.3 miles, had its beginning in a narrow gauge railway built from Weston to Buckhannon in 1883, under the name of Weston and Buckhannon Railroad Company, but was taken over by the West Virginia and Pittsburgh Railroad Company and made a standard gauge in 1891 and 1892, and in the same years was extended to Pickens, 30.5 miles being in Upshur and 9.3 miles in Randolph. It was sold to the Baltimore and Ohio Railroad in September, 1899, and is now classified as a part of its Monongah Division.

Alexander and Eastern Railroad.—The Alexander and Eastern Railroad, tributary to the Pickens Branch of the Baltimore and Ohio at Alexander in southern Upshur, and extending from that point southward up the Left Fork of Buckhannon River, crossing Back Fork Mountain at the Parting Springs and following Back Fork of Elk River to a point in Randolph County one mile east of the Webster Line, a total distance of 24.5 miles, is a standard gauge lumber railroad used mainly by the Croft Lumber Company for hauling logs to its mill at Alexander, and provides no passenger service. According to M. A. Cutright, of Alexander, it was begun as a narrow gauge line in 1891 when 8 to 10 miles were built under the name of the Alexander and Rich Mountain Railroad, but in the Fall of 1895 was changed to standard gauge and the present title was adopted.

Chemical and Helvetia Railroad. — The Chemical and Helvetia Railroad, extending from Selbyville, Upshur County, on the Pickens Branch of the Baltimore and Ohio, southeastward up a branch of the Buckhannon River to Czar in Randolph, a distance of 4.5 miles, was built in 1913 as a narrow gauge road designed to haul cord-wood to the plant of the Buckhannon Chemical Company at Selbyville, there being no passenger service.

Pickens and Hacker Valley Railroad.—The Pickens and Hacker Valley Railroad, tributary to the Pickens Branch of the Baltimore and Ohio at Pickens, Randolph County, and extending westward across a mountain and down Fall Run and Holly River to Hacker Valley, Webster County, a distance of 13 miles, is a 3-foot gauge lumber carrying road, and also carries passengers, but has no regular schedule. According to A. W. Ewing, civil engineer, of Pickens, it was begun by Henry Spies in 1899 and completed to Hacker Valley in

1903, being now the property of the Mayton Lumber Company.

Pickens and Webster Springs Railroad.—The Pickens and Webster Springs Railroad, tributary to the Baltimore and Ohio at Pickens, and extending southwestward across the mountain and down Little Sugar Creek to Skelt on the Back Fork of Elk River in Webster County, a distance of 17 miles, is a 3-foot gauge lumber road, but also hauls passengers, there being no regular schedule. According to A. W. Ewing, grading was begun by Senator J. N. Camden in 1893, steel was laid in 1900 and 1901, and the road was finally completed to Skelt in 1905, being first called the Pickens and Addison Railroad.

Coal and Coke Railway, Main Line.—The Coal and Coke Railway, extending in an east and west direction from Elkins to Charleston, a distance of 175 miles, is one of the most valuable commercial carriers in the three counties, extending entirely across Upshur and through a considerable part of Randolph, 21.6 miles of the line being in Upshur and 20.5 miles in Randolph. It was completed between Gassaway and Monroe in December, 1904, this being the last link between Leiter and Charleston. The road operated for several years over the Western Maryland tracks from Roaring Creek Junction to Elkins, but finally built its own line into the latter place in 1911.

Northern Division, Coal and Coke Railway.—The Northern Division of the Coal and Coke, extending from Belington, in Barbour, southward along the west bank of the Tygart Valley to Roaring Creek Junction where it rosses the main line, and thence southward up Roaring Creek to Mabie, a distance of 17 miles, is principally a coal and freight carrying road, having passenger service only between Roaring Creek Junction and Coalton. It was completed from Roaring Creek Junction to Coalton in 1893, from Coalton to Mabie in 1896, and from Roaring Creek Junction to Belington in 1898, according to I. K. Dye, General Manager.

Moore and Keppel Railroad.—The Moore and Keppel Railroad, tributary to the Coal & Coke at Midvale, Randolph County, and extending southward up the Left Fork of the

Middle Fork River, 17.5 miles, to Adolph, is a standard gauge lumber railroad, built to haul logs to the mill of the Moore-Keppel Company at Ellamore, and has no general freight or passenger service. It was completed to its present terminus in 1915.

Frenchton and Burnsville Railroad.—The Frenchton and Burnsville Railroad, tributary to the Coal and Coke Railway at Frenchton, Upshur County, is a 3-foot gauge lumber railroad, extending southward, 9.5 miles, to the head of Laurel Run, south of Gaines. According to Robert Boggs, of Rock Cave, it was built as a tram road in 1906, under the name of the Frenchton and Arlington Railroad, but was changed to a steam road in 1907, and in 1910 was reorganized under its present title, being a chartered railroad but having no passenger service.

Western Maryland Railway, Main Line.—The main line of the Western Maryland Railway, extending from Baltimore, Maryland, westward to Belington, a distance of 292.3 miles, following the east bank of the Tygart Valley River between Elkins and the latter point, is a commercial carrier with a large coal, general freight, and passenger business, the distance from Elkins to the Barbour Line being 11.1 miles and that portion in Barbour being 6.5 miles. According to L. F. Timmerman, Secretary and Treasurer, the line from Elkins to Belington was first built as the Belington and Beaver Creek Railroad, but was sold to the Western Maryland Railway, November 1, 1905, the original date of the completion not being available, owing to the destruction of the records of the Company in the fire of the Equitable Building in 1912.

Weaver Branch, Western Maryland Railroad.—The Weaver Branch of the Western Maryland, extending from Belington, in Barbour, southward to Weaver, in Randolph, 6.2 miles, is principally a coal carrying road, but gives general freight and passenger service, having been first completed as a branch of the Belington & Beaver Creek Railroad.

Belington and Northern Railroad.—The Belington and Northern Railroad, extending from Belington northwestward, 3.8 miles along the west bank of the Tygart Valley River, to a point one-half mile west of Wilmoth Ford, was built in 1902 as a coal carrying road, having as its ultimate object a connection with the Little Kanawha Railroad at Glenville to which point surveys of the latter road had been made. The entire project was abandoned and the line is not now in use.

Electric Railroads.

Elkins Electric Railway.—The Elkins Electric Railway extends from Elkins westward along the Tygart Valley River, 6.1 miles to Harding, where it serves a large mining population. According to P. B. Bloomfield, General Manager, work was begun at Elkins in May, 1907, the first car was run December 1, 1910, and the line completed to Harding May 1, 1914.

Highways.

Parkersburg and Staunton Turnpike.—The Parkersburg and Staunton Turnpike, which extends across Randolph and Upshur Counties in an east and west direction through Beverly, Mabie, Ellamore, Buckhannon, and Lorentz, had its beginning by act of the Virginia General Assembly passed in 1823, but was not completed until after 1853, when the final appropriation for macadamizing the road was made. The original macadam has long since disappeared, but the excellent grade remains, and if resurfaced this old road would again become one of the great highways of the State.

Morgantown and Beverly Turnpike.—The Morgantown and Beverly Turnpike, which was originally chartered in 1837 by the State of Virginia, under the name of "Pennsylvania, Beverly and Morgantown Turnpike", but was not completed until after 1853 when the charter was renewed, is a dirt road passing through Morgantown, Ridgedale, Gladesville, Independence, Evansville, Dent, Nestorville, Meadowville, Belington, and Elkins to Beverly.

Fairmont and Beverly Turnpike.—The Fairmont and Beverly Turnpike is a dirt road, extending from the former place through McGee, Simpson, Switzer, Philippi, and Belington where it coincides with the Morgantown and Beverly Turnpike.

Clarksburg and Philippi Turnpike.—The Clarksburg and Philippi Turnpike, which is nothing more than a well-graded dirt road, was established by act of the Virginia General Assembly, March 13, 1849, and its route between these two points lies by way of Grassland and Pepper.

Philippi and Buckhannon Turnpike.—The Philippi and Buckhannon Turnpike, established by act of the Virginia General Assembly, March 7, 1849, with a maximum grade of 4 degrees and a minimum width of 15 feet, is a dirt road extending between these two points by way of Malta, Burnersville, and Pecks Run. According to Cutright[1] it was completed in the early fifties.

Clarksburg and Buckhannon Turnpike.—The Clarksburg and Buckhannon Turnpike, a dirt road connecting these two points, and passing through Quiet Dell, Romines Mills, Peeltree, and Pecks Run, was established by act of the Virginia General Assembly March 8, 1848, being built largely by private subscription, as were many others constructed during the same period.

Buckhannon and Little Kanawha Turnpike.—The Buckhannon and Little Kanawha Turnpike, which was authorized by act of the Virginia General Assembly March 15, 1849, to extend from Buckhannon by way of Haymond's Mill, Braxton County, to an intersection with the Weston and Sutton road, extends southwestward from Buckhannon, passing through Hinkleville, French Creek, Frenchton, and Crawford. According to Cutright[2], it was completed in the early fifties.

Summersville and Slaven Cabin Turnpike.—The Summersville and Slaven Cabin Turnpike, starting at Summersville, Nicholas County, extends eastward by way of Webster Springs and Waneta, in Webster, and then through Monterville and Valley Head in Randolph. For many miles in Webster and Randolph it traverses Point Mountain at an elevation of 3500 to 4000 feet above sea-level, making it one of the greatest scenic highways in the State.

Ordinary County Roads.—Besides these turnpikes noted above, the three counties are covered by a network of more poorly graded dirt roads, some of which become impassable in the winter months on account of mud. According to Hon. A. D. Williams, State Road Engineer, there are 624 miles of wagon roads in Barbour, 800 in Upshur, and 1000 in Randolph.

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[1] W. B. Cutright, History of Upshur County, p. 322; 1907.

[2] W. B. Cutright, History of Upshur County, p. 322; 1907.

GENERAL DESCRIPTION, BARBOUR COUNTY.

Miscellaneous Items.

Formation.—Barbour County was formed from parts of Harrison, Lewis, and Randolph Counties, by act of the Virginia General Assembly, and named after Judge Philip Pendleton Barbour, a distinguished Virginian. Maxwell[8] gives the following detailed account of its boundaries:

> "The act of the Virginia Legislature passed March 3, 1843, establishing Barbour County, fixed its boundaries as follows:
>
> "'Beginning opposite the mouth of Sandy Creek, on the east side of the Valley River, in the now County of Randolph; thence down the said Valley River with the several meanders thereof, to Daniel's Ferry; thence a straight line to the dividing ridge on the waters of Simpson's Creek and Bartlett's Run (so as to include Reuben Davisson's farm in the new county); thence a straight line to the old farm now occupied by Samuel Bartlett; thence to the head of Goodwins' Run; thence a straight line to William Bean's on Gnatty Creek; thence a straight line to head of Peck's Run; thence with the dividing ridge between the head of Peck's Run and Hacker's Creek to the gap of said ridge where the road crossed leading down Hacker's Creek; thence a straight line to Samuel Black's residence (including the farm of the said Black in the new county) on Buckhannon Run; thence a straight line to the mouth of Sarvis' Run, on the Middle Fork of the Valley River; thence a straight line to the gap of Laurel Hill Mountain where the widow Corley's corner tree stands; thence with the top of the said mountain until it comes to the Preston County line; thence with the Preston and Randolph County line to the beginning, the whole to form one distinct and new county, and to be called and known by the name of Barbour County, in honor to and in memory of Philip P. Barbour of Virginia.'
>
> "From a minute entered in the proceedings of the county court, it is inferred that the actual line was surveyed entirely around Barbour County in 1843, as in July of that year the sum of eighty-six dollars was set aside to pay the surveyors, including guides, but no record of such a survey is found on the books of the County Surveyor. It became a matter of importance to have part of the lines accurately surveyed, and in 1894 the sum of $944.50 was paid for that purpose. The commissioners who made the survey between Barbour and Taylor were C. M. Cornwell, J. E. Hall, and M. F. Hall on behalf of Barbour, and J. F. Ross, M. W. Kinkaid, and Upton Foreman on behalf of Taylor, with J. Nelson Baker as umpire. The calls of that survey were:

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[8] Hu Maxwell, History of Barbour County, pp. 198-200; 1899.

"'Beginning at a stone pile on the corner of Harrison, Barbour and Taylor, west of Simpson's Creek, thence north 86 degrees 53 min., east 2422 feet, passing 83 feet south of the residence of John Lough. to a stone on the ridge on the John H. Woodford farm; thence south 89 degrees, 30 min., east 10942 feet to the Pleasant Creek Ford; thence north 68 degrees, 53 min., east 19068 feet to the mouth of Pleasant Creek at L. Keller's residence on the line, and so crossing the river as to have 17772 feet of railroad in Pleasant District; thence up Sandy to the mouth of Little Sandy, which is the corner of Preston, Barbour and Taylor.'

"The commissioners who surveyed the lines between parts of Barbour and Randolph were, Milton Hart and H. C. Rosenberger on behalf of Barbour; A. C. Findley, C. M. Mosteller and Jefferson Scott on behalf of Randolph, and David Poe, umpire. The line is as follows:

"'Beginning (line south 82 degrees, 45 min. west) at a hickory on top of Laurel Hill; 900 feet to a cliff; 2800 feet to a small stream; 4550 feet to a small stream; 5100 feet to P. Stipe's land; 8400 feet to Tom Corley's land; 11030 feet to Nixon Shomo's land; 12300 feet to Visquesney's line; 13400 feet to George Hayes' land; 17176 feet to Beaver Creek; 20495 feet to Valley River; 24660 feet to the north bank of the river, after crossing the second time, nearly opposite the mouth of Zebb's Creek; 26486 feet to the river again; 27500 feet to H. G. Davis' land; 30012 feet to Patrick Judge's land; 31175 feet to T. Kavanaugh's land; 33300 feet to Patrick Glannon's land; 34281 feet to Taylor's graveyard; 53447 feet to the mouth of Sarvis Run on the west bank of Middle Fork.'"

Area.—The area of Barbour, by Districts, as determined with planimeter by Teets from the topographic sheets of the U. S. Geological Survey, is as follows:

Districts.	Square Miles.
Pleasant	46.17
Elk	30.43
Union	42.19
Philippi	45.02
Cove	54.14
Glade	49.23
Barker	41.15
Valley	37.08
Totals for County	345.41

Relief.—The surface of Barbour varies in elevation from 1000 feet above sea-level at the point where the Tygart Valley River crosses the Barbour-Taylor Line to 3300 feet at the top of a high knob on the Laurel Ridge, 2 miles north of the common corner of Barbour, Randolph, and Tucker, making a total variation of 2300 feet. With the exception of this high ridge which forms the eastern boundary of the county, and where the air is perceptibly cooler in both winter and summer, there is little variation of climatic conditions over the county.

Population.—The following table, taken from the U. S. Census returns for 1910, shows the population of Barbour for the last three enumerations:

Population of Barbour County.

Minor Civil Division.	1910	1900	1890
Barker District including Junior town and wards 3 and 4 of Belington city	2,675	2,400	1,725
Belington city (part of)	742	430	......
Total for Belington city in Barker and Valley Districts	1,481	430	
Ward 1	425		
Ward 2	314		
Ward 3	401		
Ward 4	341		
Junior town	435	335	
Cove District	1,770	1,894	1,986
Elk District	723	874	912
Glade District	1,286	1,535	1,517
Philippi District, including Philippi city	3,652	2,769	2,443
Philippi city	1,038	665	378
Ward 1	250		
Ward 2	250		
Ward 3	288		
Ward 4	250		
Pleasant District	2,050	1,951	1,620
Union District	1,696	1,280	1,171
Valley District, including wards 1 and 2 of Belington city	2,006	1,495	1,328
Belington city, part of	739		
Totals for County	15,858	14,198	12,702

The returns show that those districts devoted to agriculture alone have lost in numbers while all those in which mining plants are located have increased.

Products.—The principal animal products of Barbour are cattle, horses, sheep, hogs, poultry, and mules.

The principal agricultural products are corn, potatoes, hay, apples, wheat, oats, and buckwheat. The western part of the county is especially adapted to forage crops, being natural blue-grass land. East of the Tygart Valley River buckwheat is raised extensively.

The principal mineral and manufactured products are coal and coke, brick, clay, building stone, lumber and woolen goods.

Property Valuation.—According to Hon. J. S. Darst, State Auditor, the following table shows the property valuation for three years ending with 1915:

	1913	1914	1915
Real Estate	$10,937,140	$11,052,230	$10,903,240
Personal Property	2,950,427	3,090,425	3,030,575
Totals	$13,887,567	$14,142,655	$13,933,815

According to the above figures, Barbour ranks twenty-first in the State in point of wealth.

Postal Service.—As in many other counties in the State, the reorganization of the Post-Office Department and consequent establishment of rural free delivery routes has caused many of the smaller post-offices to be abandoned. The numerous rural routes, however, cover almost the entire county, and these, together with the railway mail service, afford ample means for the distribution of the mail in a speedy and efficient manner. The following table, compiled from information supplied by W. G. Keys, Postmaster of Philippi, shows the post-offices and rural routes now (October 25, 1915) in existence in the county:

Barbour County Post-Offices.

Post-Offices.	No. of R. F. D. Routes.	Post-Offices.	No. of R. F. D. Routes.
Arden		Kasson	
Belington	4	Lantz	
Berryburg		Lillian	
Century		Meriden	
Dartmoor		Moatsville	3
Hall	2	Nestorville	
Johnson		Philippi	5
Junior		Volga	2

The above information shows that Barbour County has 16 post-offices and 16 rural free delivery routes.

Towns and Industries.

There are only three incorporated towns in Barbour, but there are numerous thriving villages that have no separate town governments.

Philippi.

Philippi, the county-seat of Barbour, and the second largest town, having a population of 1,038 people in 1910, nearly double the number recorded for 1900, is situated on the Tygart Valley River, near the geographical center of the county. According to Lewis[4], it was established by act of the Virginia General Assembly, passed Feb. 14, 1844, with L. D. Morrell, James L. Burbridge, William Shaw, John R. Williamson and William Wilson, trustees, being named in honor of Philip Barbour.

Philippi was originally laid out and built on the east side of the river, where the flood-plain affords a natural town site, the elevation above sea being about 1300 feet, but the rapid growth in late years has extended the boundaries across the river and up the hillsides on either side. It owes its existence principally to the county business and partly to the excellent agricultural region which surrounds it, and for which it is the natural supply point. Besides these features, it has a considerable coal mining industry near by and also has one of the prominent private educational institutions of the State. The town is served by the Grafton and Belington Branch of the Baltimore and Ohio Railroad which affords convenient freight and passenger service in all directions.

Broaddus Institute.—The Broaddus Institute, located on Battle Hill west of the river, and commanding a beautiful view of the Tygart Valley, was first established in Clarksburg in 1876 as the Broaddus Female College, but according to President Elkanah Hulley, the institution was removed to Philippi in September, 1909. It has an enrollment of 200 students, the number of instructors being 14, and there are two large brick buildings besides the central heating plant.

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[4] V. A. Lewis, History of West Virginia, p. 683; 1889.

The courses of study include preparatory, normal, and college work, the supporting and governing agency of the school being the Baptist Church.

Philippi Woolen Mill Company.—The Philippi Woolen Mill Company, established in 1915, with head office and works along the west bank of the Tygart Valley River, manufactures woolen goods, mostly blankets. According to W. L. Fordyce, Superintendent, the mill will have an equipment of 2 sets of cards, 10 looms, and 1500 spindles, giving a capacity of 100 pairs of blankets daily, 15 men and 20 women being employed, of whom 4 or 5 are classed as skilled laborers, the monthly pay-roll being $1000.

The Philippi Foundry and Machine Company, located along the Baltimore and Ohio Railroad at the south end of the town, has not been in operation for several years, the enterprise being apparently abandoned as the plant has been dismantled, although the substantial brick building in which it was housed is still standing.

The Philippi Tile and Brick Plant, located near the old foundry, and the **S. T. H. Holt Brick Plant,** located north of the town, will be described in Chapter XIII under the subject of "Brick Plants".

Belington.

Belington, the first town of Barbour in point of size, is located along the flood-plain of the Tygart Valley River, near the southern end of the county, its elevation above sea-level being 1702 feet and its population in 1910 being 1,481, more than three times as large as in 1900. The town was named from John Bealin who moved there from Philippi before the Civil War and built a store, but it was not incorporated as a city until 1905. Belington is not only the supply point for a considerable farming district, but is also in the midst of several large mining operations that have contributed in large measure to its commercial expansion. It is the terminus of the Grafton and Belington Branch of the Baltimore and Ohio Railroad and also the western terminus of the Western Maryland Railway, and is also served with freight by the Northern Division of the Coal and Coke. A large steel mill was once built along the Western Maryland Railway, about one mile south of Belington, but the enterprise was a failure and the plant has been dismantled. The **Tygart Valley Brick Company** will be described in Chapter XIII under the subject of "Brick Plants".

Junior.

Junior, the only other incorporated town in the county besides the two just described, is located along the Tygart Valley River, 4 miles south of Belington, its principal reason for existence being the large coal mine located there. It was incorporated as a **town** November 13, 1897, and, according to the census of 1910, has a population of 435.

Villages.

There are numerous unincorporated villages situated throughout Barbour County, of which the following list gives the principal ones with their populations, most of which are by actual count made in the presence of members of the Survey, the coal mining towns being printed in black-faced type:

Barbour County Villages.

Village.	Population 1915	Village.	Population 1915
Arden	150(E)	**Lillian**	70(A)
Audra	30(E)	Meadowville	39(A)
Berryburg	500(A)	**Meriden**	40(E)
Burnersville (Volga)	75(A)	Moatsville	157(A)
Century	1200(E)	Nestorville	118(A)
Danville	30(E)	Overfield	30(E)
Dartmoor	235(A)	Peeltree	50(E)
Hall	20(E)	Teter's Mill (Boulder)	30(E)

A—Actual count by Postmaster or other responsible person in 1915.

E—Estimate by postmaster or other responsible person in 1915.

GENERAL DESCRIPTION, UPSHUR COUNTY.

Miscellaneous Items.

Formation.—Upshur County was established out of parts of Randolph, Barbour and Lewis, by act of the Virginia General Assembly, passed March 26, 1851, and was named after Hon. Abel P. Upshur, Secretary of State under President Harrison, in which capacity he was serving when killed by a bursting cannon on board a United States war vessel. According to Cutright[5], the boundaries established were as follows:

> "Be it enacted by the General Assembly, That so much of the counties of Randolph, Barbour, and Lewis as is contained within the following boundary lines, to-wit: Beginning at a rock or milestone on the Staunton and Parkersburg turnpike road, ten miles east of Weston, in Lewis County, running thence a straight line to the head of Saul's Run, a branch of Fink's Run; thence to the mouth of Pringle's Fork of Stone Coal Creek; thence up said fork to the forks of said fork; thence with the ridge dividing the waters of said forks to their headwaters, and with said ridge to the head of French Creek above Taylor Townsend's farm; thence to the mouth of Cherry Camp Fork of the Little Kanawha River; thence to the mouth of the Buffalo Fork of said river to the Braxton County line, and with said line to the head of the right hand fork of said river; thence to the three forks of the Right Hand Fork of Buckhannon River; thence to the head nearest branch of Middle Fork River; thence down said river to the fording where the road leading from Teter's on the Valley River to House's mill on the Buckhannon River, crosses said Middle Fork; thence to the fording of the Buckhannon River, at or near Henry Jackson's; thence to Michael Strader's on Peck's Run, including said Strader's; thence with the ridge dividing the waters of the main Peck's Run from the waters of the branch on which Colonel John Reger now resides; thence with said ridge so as to divide the waters of Peck's Run from Big Run to Gnatty Creek Mountain; thence to the mouth of the run on which John Low resides, so as to include all the waters of said run to Peel Tree Mountain; thence running west to the Harrison County line; thence with said line to a stone standing on the line of Lewis and Harrison Counties and on the dividing line between Lost Creek, Rooting Creek and Jesse's Run; thence a straight line to the mouth of Rover's Run, a branch of Hacker's Creek, and thence to the beginning, shall form one distinct and new county, and be called and known by the name of Upshur County."

Area.—The area of Upshur by Districts, as determined with planimeter by Teets from the topographic maps of the U. S. Geological Survey, is as follows:

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[5] W. B. Cutright, History of Upshur County, p. 240; 1907.

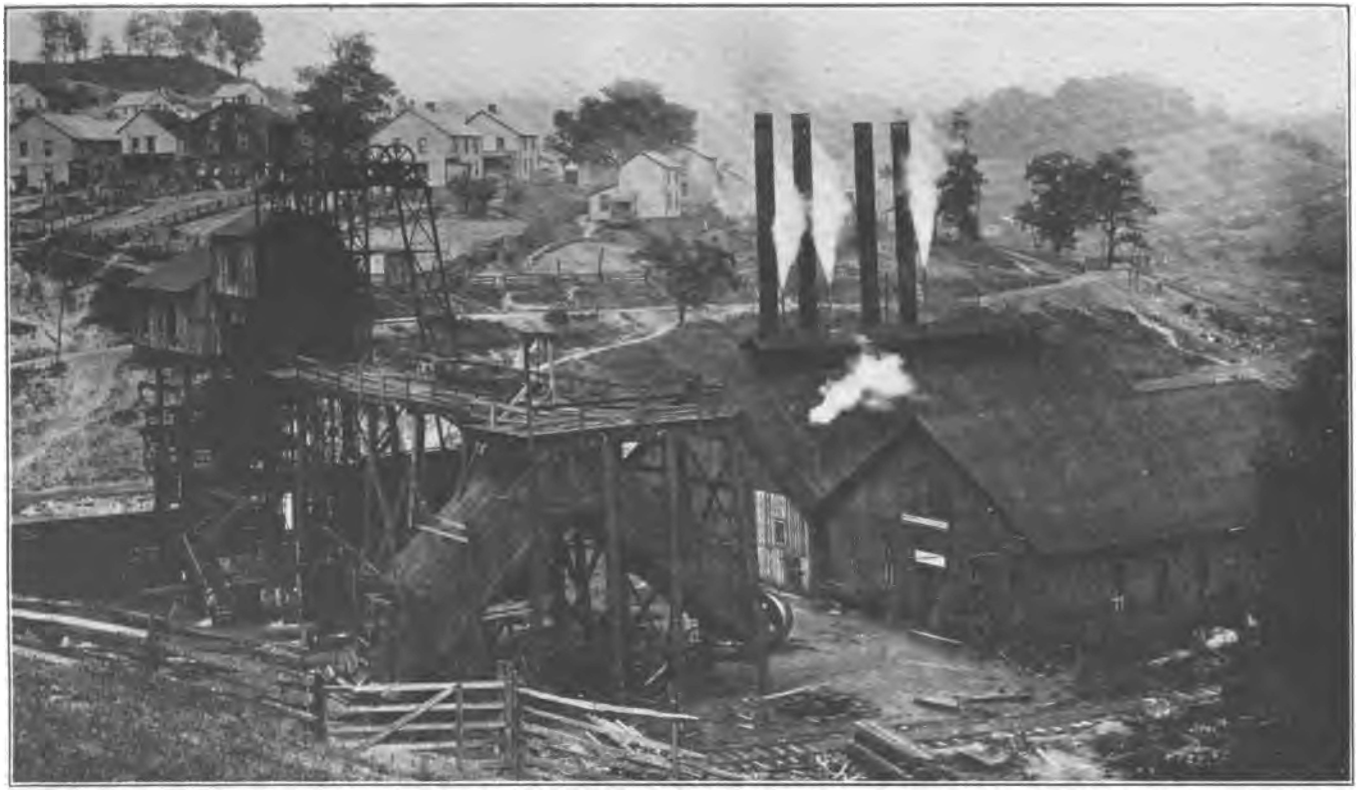

PLATE II.—Mining plant of Century Coal Company at Century, Barbour County (No. 11 on Map II), miners' houses and topography of the Monongahela Series in background.

Districts.	Square Miles.
Warren	45.58
Buckhannon	37.86
Union	50.97
Meade	57.50
Washington	71.76
Banks	91.19
Totals for County	354.86

Relief.—The surface of Upshur varies from 1038 feet above sea-level at Ingo on the Little Kanawha River, where this stream crosses the Lewis Line, to 3050 feet at the southeast corner of the county, 1.7 miles southeast of Palace Valley, a total difference of 2012 feet. These two points are both in the southern end of the county where the Little Kanawha River has cut its channel into the high foot-hills of Rich Mountain, and they therefore represent a much greater variation than is found in the central and northern end of the county where the hills are only a few hundred feet high.

Population.—The following table, taken from the U. S. Census Returns for 1910, shows the population of Upshur for the last three enumerations:

Population of Upshur County.

Minor Civil Division.	1910	1900	1890
Banks District	3,508	3,201	2,577
Buckhannon District, including Buckhannon and South Buckhannon towns	4,507	3.489	2,542
Buckhannon town	2,225	1.589	1,403
South Buckhannon town	681	.....	.....
Meade District	2,623	2,316	2,124
Union District	2,321	2,115	1,941
Warren District	1,201	1,239	1.418
Washington District	2,469	2,336	2,112
Totals for County	16,629	14,696	12,714

The returns show an increase of population in all the Districts except Warren, where there has been a steady decrease owing to the steady migration to the towns and cities.

Products.—The principal animal products of Upshur are cattle, horses, sheep, hogs, poultry, and mules.

The principal agricultural products are corn, potatoes, hay, apples, wheat, oats, and buckwheat. The northern end of the county is especially adapted to forage crops, being natural blue-grass land. Buckwheat is raised extensively in the southern portion.

The principal mineral and manufactured products are coal and coke, glass-sand, and glassware, brick clay, building stone, natural gas, and lumber.

Property Valuation.—According to Hon. J. S. Darst, State Auditor, the following table shows the property valuation for the three years ending with 1915:

	1913	1914	1915
Real Estate	$ 8,178,306	$ 8,219,523	$ 8,256,902
Personal Property	2,780,868	3,151,364	3,179,654
Totals	$10,959,174	$11,370,887	$11,436,556

A comparison of the above figures with those for other counties in the Auditor's Report shows that Upshur ranks thirty-first in point of wealth in the State.

Postal Service.—As noted in Barbour, the establishment of rural free delivery service has caused many former post-offices to be abandoned, the work of which is now done, however, by the railway mail and rural routes. The following table, compiled from information supplied by L. W. Bartlett, Postmaster of Buckhannon, shows the number of post-offices and rural free delivery routes now (October, 1915), in existence in the county:

Upshur County Post-Offices.

Post-Offices	No. of R. F. D. Routes.	Post-Offices	No. of R. F. D. Routes.
Abbott		Ivanhoe	
Adrian		Kanawha Head	
Alexander		Kedron	
Alton		Lorentz	
Buckhannon	4	Newlonton	
Canaan		Queens	
French Creek	2	Red Rock	
Frenchton		Rock Cave	
Gaines		Sago	1
Gale		Sandrun	
Gawthrop		Selbyville	
Goodwin		Tallmansville	
Gould		Tenmile	
Hemlock		Teter	
Holly Grove		Vegan	
Indiancamp		Yokum	

Towns and Industries.

There are only two incorporated towns in Upshur, but there are numerous thriving villages that have no separate town governments.

Buckhannon.

Buckhannon, the county-seat of Upshur, and the largest town, was first settled by Edward Jackson and family in the Fall of 1770, but was not legally established as a town until January 15, 1816, when it was laid out on the lands of Robert Patton, Jr., with Joseph Davis, Jacob Lorentz, Philip Reger, John Jackson, John Reger, Benjamin Reeder and John McWhorter, trustees[6]. According to Cutright[7], it was named after John Buchannon, a Scotch missionary of Richmond, Va., who made a trip through the Upper Monongahela Valley, the name being later corrupted to its present spelling, which was applied first to the river, and subsequently, to the town.

Buckhannon is located at a natural town site on the Buckhannon River, near the northern end of the county, the tidal elevation of the court-house being 1433 feet. According to the census of 1910, its population was 2225, an increase of 29 per cent. over that of 1900. It owes its existence primarily to the county business and to the fact that it is the natural supply point for the rich farming and grazing region that surrounds it, but its progress and growth have been greatly augmented by several large woodworking and general manufacturing industries as well as by the presence of one of the leading private colleges of the State. The town is served by the Pickens Branch of the Baltimore and Ohio Railroad and by the Point Pleasant, Buckhannon and Tygart Valley Railroad, which is under the control of the same system, the two roads giving convenient freight and passenger service.

West Virginia Wesleyan College.—The West Virginia Wesleyan College, located along the line between Buckhannon and South Buckhannon Corporations, the principal buildings being in the latter town, is one of the leading educational institutions of the State, having been first established as a preparatory school with the name of the "West Virginia Conference Seminary", but being changed to its present title and raised to college rank in 1903. According to information supplied from the office of Dr. Wallace B. Fleming, President, the courses of instruction include Collegiate, Preparatory, Normal, Music, and Art Departments, the degrees of A. B., B. S., and B. Ped. being granted. There is a campus of 43 acres with seven buildings, the total property and endowment being valued at $450,000. The average number of students is 450, and 28 teachers are employed with an average yearly pay-roll of $30,000, the school being conducted under the auspices of the Methodist Episcopal Church, and supported by the tuition of students, income from endowment, and generosity of friends. The following clipping, from the annual catalog, gives the early history of the college:

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[6] Virgil A. Lewis, History of West Virginia, p. 720; 1889.
[7] W. B. Cutright, History of Upshur County, p. 274; 1907.

> "In 1876 Buckhannon presented a request and a pledge of money to the West Virginia Conference to locate a seminary in the town. In 1883 a committee appointed by the Annual Conference recommended the establishment of a seminary, and a year later the Conference appointed a board of trustees for the proposed school. The Conference enlarged the board of trustees in 1885 and directed it to receive contributions and proposals for the endowment and location of a seminary; and on August 29, 1887, the trustees purchased 43 acres at Buckhannon for $5,551.87. In October of the same year the Conference in session at Parkersburg ratified the action and directed the trustees to proceed with the erection of the buildings. The main building was completed during the summer of 1890 and school was opened September 3rd of that year. The Ladies' Hall was erected in 1895 and in 1902 the Music Hall was completed. About 1892 the President's Residence was built."

Equitable Window Glass Company.—The Equitable Window Glass Company, located on the Pickens Branch of the B. & O. just west of the Buckhannon corporation line, according to information supplied to Teets by George A. Quertinmont, Secretary, was first established in 1902 under the name of the State Window Glass Company, but underwent several changes in name and ownership and finally received its present ownership and title in 1912. The plant is devoted to the manufacture of window glass only, having a 30-pot furnace and a monthly output of 11,000 boxes of 100 pounds capacity each, using sand from Imperial, and lime from Martinsburg, both in West Virginia. The product is all hand blown, 140 men being employed, of whom 80 are skilled laborers, the total monthly pay-roll being $16,000, the plant being in operation for seven months of the year. Most of the product is shipped to eastern points.

Belgrade Glass Company.—The Belgrade Glass Company, located on the Pickens Branch of the B. & O. at Tenerton Station, one mile and a half south of Buckhannon, was first established as the Steiner Glass Company in 1903, but came under its present management and title in 1910, according to F. A. Treiber, Secretary and Treasurer. The plant manufactures lead blown tumblers and stem ware, to the value of $80,000 worth annually, the equipment including a 12-pot furnace, and gives employment to 100 persons of whom 65 are men, 20 are boys and 15 are girls, the number of skilled laborers being 40, and the average monthly pay-roll, $5,000, for the 11 months of the year that the plant runs. The factory uses sand from Berkeley Springs, W. Va., lime from Ohio, lead from Pittsburgh, Pa., soda-ash from Michigan and coloring matter mostly from Europe, although some of this is now secured in America. Natural gas is used for fuel, which the West Virginia Central Gas Company furnishes at 8 cents, net, per thousand. The product is shipped in all directions.

William Grosscup Planing Mill.—The William Grosscup Planing Mill, with its principal office at Buckhannon, located along the Pickens Branch of the B. & O., about one-fourth mile east of the railroad station, was established, according to information supplied Teets by Alvin Grosscup, General Manager, in 1907, and manufactures flooring, siding, molding, interior finish, and general planing mill material, the daily capacity being 15,000 feet, and output about 10,000, the product being shipped to West Virginia and eastern points. Ten men are employed, 4 of these being classed as skilled laborers, and the monthly pay-roll is $500 to $600.

Upshur Planing Mill.—The Upshur Planing Mill, located on the Pickens Branch of the B. & O., about one-fourth mile east of the railroad station, according to information furnished by T. W. Curry, General Manager, was established in 1908 with its principal office in Buckhannon, and manufactures oak flooring and all kinds of exterior and interior finishing material, the output being 2 to 3 car-loads per week, the raw material for which comes from Upshur and adjoining counties, and the finished product being shipped east and west. Fifteen men are employed, of whom 8 are skilled laborers, the average monthly pay-roll being $800. This plant was originally known as the Stockert Brothers Planing Mill, but passed into the hands of the J. L. Henry Lumber Company in 1900, and to its present ownership at the date above mentioned.

Buckhannon Box and Resaw Company.—The Buckhannon Box and Resaw Company, with its head office at Buckhannon and located on the Pickens Branch of the B. & O. near the South Buckhannon Station, was established in March, 1915, according to information supplied Teets by T. M. Debarr, President. The plant manufactures box shooks, crating, flooring, siding, all kinds of inside finishing material and a general line of framing timber, the daily output being 12,000 to 15,000 feet, the raw material coming from Upshur and adjoining counties. Thirteen men are employed, of whom 3 are skilled laborers, the monthly pay-roll varying from $300 to $600.

Layfield Manufacturing Company.—The Layfield Manufacturing Company, with its head office at Buckhannon and plant located on the Pickens Branch of the B. & O. near the South Buckhannon Station, was established in 1912, and manufactures all kinds of exterior and interior wood finish, its capacity being 15,000 feet and output 5,000 feet per day, the raw material for which comes from Upshur and adjoining counties, the product being shipped in all directions. According to information supplied Teets by A. Layfield, General Manager, 14 men are employed, of whom 5 are skilled laborers, the monthly pay-roll averaging $500.

William Flaccus Oak Leather Company.—The William Flaccus Oak Leather Company, with head office at Pittsburgh, Pa., operates a large tannery located along the Pickens Branch of the B. & O. near the corporation line between Buckhannon and South Buckhannon, having been established in 1889. According to information supplied Teets by Alfred Vogt, Assistant Manager, the plant manufactures harness leather, the capacity being 600 hides per week and output 1 car-load in 2 to 3 weeks, a car holding from 1500 to 2000 hides, and the most of the finished product being shipped to Pittsburgh. The hides used for tanning come mostly from the large packing houses of the country, but the tan-bark is a local product of Upshur and adjoining counties. The tanning process is an elaborate one, requiring several months to turn out the finished leather. Forty-two men are employed, of whom 7 are skilled laborers, the average monthly pay-roll being $1600.

Ward-Young Manufacturing Company. — The Ward-Young Manufacturing Company, with its plant located near the Baltimore and Ohio Railroad station, was established in 1909 and manufactures stogies, the capacity of the concern being 600,000 per year and output about 200,000. According to information supplied to Teets by the management, 3 men and 2 women are employed, the average monthly pay-roll being $300. The leaf tobacco comes from Ohio and Pennsylvania.

Price Bottling Company.—The Price Bottling Company, with principal office at Kitzmiller, Md., and having a plant located in Buckhannon near the Baltimore and Ohio Station, manufactures soft drinks and soda fountain supplies, the local concern having been in operation since 1913. The capacity is 2000 cases per month and output 1000 cases, 4 boys being employed, with an average monthly pay-roll of $125. According to information given Teets by J. M. Price, General Manager, the product is marketed in Upshur and adjoining counties.

Core Brick Plant.—The Core Brick Plant, located near the South Buckhannon railroad station, will be described in Chapter XIII under the subject of "Brick Plants".

South Buckhannon.

South Buckhannon, situated along the Buckhannon River immediately south of Buckhannon, was incorporated as a town in 1900, the population given in the Census Returns for 1910 being 681. A separate post-office was maintained for several years, but this is now abandoned and the town is served by the Buckhannon post-office and city carriers. The two towns have such a close alliance that little attention is paid to their separate charters except in political and financial matters. Several of the industrial establishments previously described among those in Buckhannon are situated in the corporate limits of South Buckhannon as is also most of the Wesleyan College property, a reference to this fact having been made in each case.

Villages.

There are numerous villages situated throughout Upshur County, of which the following list gives the principal ones with their populations, most of which are by actual count made in the presence of members of the Survey, the coal mining towns being printed in black-faced type:

Upshur County Villages.

Village.	Population 1915	Village.	Population 1915
Abbott	31(A)	Holly Grove	26(A)
Adrian	200(E)	Imperial	30(E)
Alexander	300(E)	Kedron	35(E)
Alton	122(A)	Lantz	40(E)
Arlington	55(A)	**Lorentz**	150(E)
Beans Mill	25(E)	Newlon (Newlonton P. O.)	81(A)
Canaan	25(E)	Overhill	30(E)
Evergreen	45(R)	Pecks Run	67(A)
French Creek	151(A)	Queens	33(A)
Frenchton	153(A)	Rock Cave	141(A)
Gaines	30(E)	Sago	50(E)
Hampton (Ivanhoe P. O.)	55(A)	Sand Run	40(E)
Hemlock	30(E)	Selbyville	75(E)
Hinkleville	54(A)	Tenmile	80(A)
		Teter	40(E)

A.—Actual Count by Postmaster or other responsible person in 1915.

E.—Estimate by Postmaster or other responsible person in 1915.

R.—Rand, McNally & Co. Commercial Atlas, 1915.

GENERAL DESCRIPTION, WESTERN PORTION OF RANDOLPH COUNTY.

Miscellaneous Items.

Formation.—Randolph County, the largest in the entire State, was established by act of the Virginia General Assembly, passed in October, 1786, as follows, according to Lewis[8]:

> "That from and after the first day of May, one thousand seven hundred and eighty-seven, the county of Harrison shall be divided into two distinct counties, that is to say, so much of the said county lying on the southeast of the following lines, beginning at the mouth of Sandy Creek; thence up Tygart's Valley River to the mouth of Buckhannon River; thence up the said river including all the waters thereon; thence down Elk River, including the waters thereof, to the Greenbrier line, shall be one distinct county, to be called and known by the name of Randolph; and the residue of the said county shall retain the name of Harrison."

The county, as above outlined, which was named after Governor Edmund Randolph, of Virginia, has been later subdivided to form portions of several new counties, but still contains approximately 1091 square miles of territory. Since this report deals only with the coal-bearing portion west of Laurel Ridge and Rich Mountain and north of Elk River, the following table computed by Teets with planimeter from the topographic sheets of the U. S. Geological Survey, gives the areas for this portion only:

Districts.	Square Miles.
Leadsville (west of Laurel Ridge and Rich Mountain)..	8.75
Roaring Creek (Entire)...........................	66.09
Middle Fork (Entire)............................	160.17
Huttonsville (Part covered by Pennsylvanian Rocks, See Map IV)................................	11.75
Mingo (west of Rich Mountain and north of Valley Fork of Elk)................................	22.50
Total area of western coal basin..................	269.26

Relief.—The portion of Randolph outlined above varies in elevation from 1750 feet above sea-level at Laurel where the Tygart Valley River crosses the Barbour Line to 4000 feet on Point Mountain at the southern extremity, making a total difference of 2250 feet. A large part of this land is extremely rough and mountainous, much of it being wooded.

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[8] Virgil A. Lewis, History of West Virginia, p. 560; 1889.

Population.—The following table taken from the U. S. Census Returns for 1910 shows the population entire for the six districts named above, for the last three enumerations:

Population of Six Western Districts of Randolph County.

Minor Civil Division.	1910	1900	1890
Huttonsville District, including Huttonsville and Mill Creek towns	2,936	1,638	1,172
Huttonsville town	251	......	......
Mill Creek town	740	......	......
Leadsville District, including Elkins city and Harding village	8,420	4.495	1.913
Elkins city	5,260	2,016	737
Ward 1	1,152		
Ward 2	741		
Ward 3	950		
Ward 4	940		
Ward 5	1,477		
Harding village	105		
Middle Fork District	2,196	2,071	1,648
Mingo District	1,093	1,165	1,055
Roaring Creek District, including Womelsdorff town	1,905	1,437	872
Womelsdorff town	665		

Products. — The principal products of this portion of Randolph, besides small farm crops in the northwestern portion, consist mostly of coal, coke, and lumber, all of which are produced in great quantity.

Towns.

Womelsdorff.

Womelsdorff (Coalton Station and Post-Office), the largest town in Randolph west of Rich Mountain, is located on Roaring Creek, three miles above its mouth. According to Stephen Womelsdorff, mayor, it was incorporated as a town May 8, 1895. The population in 1910 was 665 persons, a large part of whom are engaged in the great coal mining plant to which the town owes its growth and which will be described later in the Chapter on Coal.

Harding.

Harding.—Harding, the only other incorporated town west of Rich Mountain in Randolph, is located on the Tygart Valley River, one-half mile north of the mouth of Roaring Creek, being built on the great bluffs formed by the upper sandstones of the Pottsville Series, one hundred feet or more above river level. It was incorporated as a village in 1909, the census returns for 1910 showing 105 persons, but the population is now larger. Its existence and growth are due to the large mining plant located there which will be fully described in the Chapter on Coal.

Villages.—There are several villages located in this area of Randolph having no town charters. The following table gives the most important, with an estimate of the population:

Villages of Western Randolph.

Village.	Population 1915	Village.	Population 1915
Cassity	60(E)	Pickens	400(E)
Ellamore	500(E)	West Huttonsville (Adolph P. O.)	50(E)
Mabie	250(E)		

E.—Estimate by Postmaster or other reliable person in 1915.

CHAPTER II.

PHYSIOGRAPHY.

PHYSIOGRAPHIC CHANGES.

The surface rocks of Barbour, Upshur, and Western Randolph present only a continuation of the general physiographic features noted in many previous reports on counties lying farther west, since such changes as may be noticed are those due to more complex conditions rather than to essential differences. It is a well-established fact that, previous to Permian time, the strata of these counties lay approximately level, but that during the Permian a great series of lateral folds were formed in the western Appalachian region, resulting in gentle dips along the Appalachian Geosyncline that passes through the western part of the State, but becoming more noticeable in the eastern counties until they culminated in the great folds of the Appalachian region. Subsequent to this era of folding a long interval of gradual erosion took place until in Cretaceous time the central and western counties had been reduced to a peneplain with only occasional monadnocks extending above it, conspicuous among which may be mentioned Bear Knob in northwestern Upshur and Turkeybone Mountain in Randolph south of Pickens. The general character of this great peneplain was that of a gentle slope from the mountains northwestward toward the great basin.

The Cretaceous peneplain had hardly been completed when another season of uplift occurred that raised the general surface to a much higher level, until in late Cretaceous or early Tertiary time the work of erosion began again, reducing the general surface to a second peneplain in the latter period. Late in the Tertiary a third series of foldings occurred that raised the Alleghanies to their greatest height. The present period being one of erosion, the irregularities of the last uplift are now being reduced toward the inevitable peneplain.

A view from Bear Knob southeastward toward Rich Mountain presents a gradual succession of higher and higher ridges, culminating in this great escarpment, which, together with the Laurel Ridge, its northern extension, forms the eastern boundary of the area studied in this report. This general succession is broken here and there by sharp peaks that rise 100 feet or more above the general level of the ridges, each of these being a monument to one of the previous cycles of erosion. In western Upshur a noticeable feature is present along a line starting at Rock Cave and extending roughly northeastward parallel to the line of strike, by way of Frenchton, Abbott, Brushy Fork, and Buckhannon to Post Mill, along which local peneplanation has been carried to a much more advanced stage in the soft shales of the Conemaugh Series. In eastern Barbour much the same condition occurs along the axis of the Belington Syncline, between Belington, Meadowville, and Nestorville where peneplanation is far advanced in these same Conemaugh shales.

Instances of stream capture are numerous. In general, the waters of the West Fork and the Little Kanawha Rivers are rapidly cutting their way into the drainage basins of the Buckhannon and Tygart Valley Rivers, these two latter streams occupying a much higher level so that a channel once cut through from the lower drainage basin will often secure the water of a considerable stream. A comparison of the parallel drainage basins of the West Fork and the Buckhannon together with the Tygart Valley into which it flows while preserving the same general course, shows that Clarksburg on the West Fork is approximately 300 feet lower than Philippi at an opposite point on the Tygart Valley, and Weston on the West Fork is 400 feet lower than Buckhannon at the opposite point on the Buckhannon River. This difference together with the further favorable fact that the surface rocks between the two drainage basins are mostly the soft red shales of the Conemaugh Series, has given the waters of West Fork a powerful advantage. In northern Barbour the topography seems to indicate that the watershed between Simpson Creek of West Fork and Foxgrape Run of the Tygart Valley was once located near Astor in the edge of Taylor County, as the directions of Bearden Run, West Branch, and Camp Run indicate that their drainage flowed past the low divide at Berryburg and through the channel of Foxgrape Run to the Tygart Valley.

The valley of Elk Creek offers another well-known example of stream piracy. East of Overfield the tributary streams all point eastward, showing that at some former time the parent stream must have also had this same general direction, and the topography indicates that this water once reached the Tygart Valley through the valley of a small branch one mile and a half south of Philippi. The original watershed was probably just east of Overfield.

In northern Upshur, Charity Fork once flowed into Pecks Run, but Gnatty Creek has stolen this water and turned it westward at an angle of more than ninety degrees from its original course. Gnatty Creek is also rapidly cutting its way into the main drainage of Pecks Run. Ray V. Hennen is authority for the statement that at the low gap 1.6 miles northwest of Pecks Run village a cut 100 feet long and 25 feet deep would divert the western end of Pecks Run into Gnatty Creek.

A further study of the topographic map reveals that at the head of Hackers Creek, 1.2 miles southwest of Pecks Run, the waters of the creek have almost eaten their way into the drainage of Sugar Fork of Turkey Run, there being only a low divide left. It is a significant fact, as shown by Map IV, that both the Pittsburgh and Redstone Coals lie at such a level here that when once mined, drainage channels would be established along the westward dip that would aid materially. The elevation of the Pittsburgh Coal at the extreme head of Hackers Creek is 1400 feet and the elevation of the Buckhannon River at the mouth of Turkey Run is the same, so that the mining of the coal in this region may cause the eventual capture of the Buckhannon River for the West Fork through the medium of Hackers Creek.

The map also shows that at the divide between Stonecoal

Creek and Fink Run, one-half mile west of Lorentz, a further erosion of 40 to 50 feet might turn the waters of the Buckhannon River into Stonecoal Creek and West Fork through the channel of Fink Run. At this point, also, the Redstone Coal has a westward dip, cropping near Lorentz on the Buckhannon side of the watershed at an elevation of about 1400 feet and appearing again on the head of Stonecoal at an elevation of 1300 feet. The mining of this coal will no doubt hasten the eventual cutting through the watershed.

Another instance of the unequal struggle between the two rivers, previously mentioned by the writer[1], occurs near Atlas, where the Right Fork of Stonecoal Creek has cut its way through the soft Conemaugh shales, securing the drainage from Wolfpen Run, Straight Run, Pringle Fork, Brushlick Run, Bear Run, Spruce Fork, and Glady Fork, all of which, from their direction, evidently once flowed eastward through Brushy Fork of Fink Run to the Buckhannon River at Buckhannon, it being plain that the watershed between Brushy Fork and Right Fork of Stonecoal was once located in Lewis County, a short distance west of Wolfpen Run.

The four instances above enumerated, at the head of Elk, at the head of Hackers Creek, at Lorentz, and at Atlas, indicate a lively contest between the West Fork tributaries for the honor of first tapping the main drainage channel of the Buckhannon. Time alone will tell which of these streams will win, but the final capture of the Buckhannon at one of these points seems inevitable.

In the region southwest of Frenchton the West Fork has robbed French Creek of much of its drainage, including Fall Run, Straight Fork, Crooked Run and Whites Camp Fork, the divide of the parent streams having once been less than one-half mile east of Jewell Station.

The Little Kanawha River in southern Upshur is also active in its assault on the drainage of the Buckhannon River, as previously noted by Taff and Brooks, as follows:[2]

> "Other striking examples of diverted streams may be seen in the whole of the drainage of Little Kanawha River above Arlington. The headwater drainage of this river has persistently and rapidly cut

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[1] Lewis and Gilmer Report, W. Va. G. S., p. 22; 1916.

[2] Buckhannon Folio No. 34, U. S. Geological Survey; 1896.

> northward, moving its watershed, and has captured the waters of Laurel, Cow, and Getout Runs, which originally belonged to French Creek and flowed northward into Buckhannon River."

The instances outlined above indicate that French Creek must have lost more than half of its original drainage to t tributaries of West Fork and Little Kanawha.

In eastern Barbour a noticeable feature is Teter Cre which, in the neighborhood of Kirt, flows northward for several miles along a high shelf well up against the Laurel Ridge. On the west side the tributaries of Sugar and Glady Creeks have cut their channels almost through the low dividing ridge and will evidently soon rob Teter Creek of this portion of its drainage area.

The three rivers shown on Map I, the Buckhannon, Middle Fork, and Tygart Valley, seem to have been influenced but little by the geologic structure. They have all preserved their courses regardless of the pitch of the rocks or the direction of the anticlines and synclines. Locally, however, these rivers all have frequent meanders although their valleys are narrow, indicating that these bends were developed during one of the ancient peneplains, probably the Cretaceous, and that they have been preserved practically intact in the subsequent elevations of the land, and that the present cycle of erosion is still too young for them to have cut wide valleys. The Tygart Valley above Elkins, however, shows a typically base-leveled condition as the meanders are all confined to the valley. This condition is very probably due to the fact that the stream here flows through the relatively soft strata of the Upper Devonian, enabling it to reach base-level more quickly than otherwise.

DRAINAGE BASINS.

The following table, prepared by Teets, gives a list of the principal streams of the area of this Report, their lengths being divided into sections, usually between large tributaries, and the rate of fall and length, both actual stream measurement and air-line distances, being determined. The last column shows the ratio between the total distance (T.D.) and the air-line distance (A.L.D.). Those having the greatest ratio

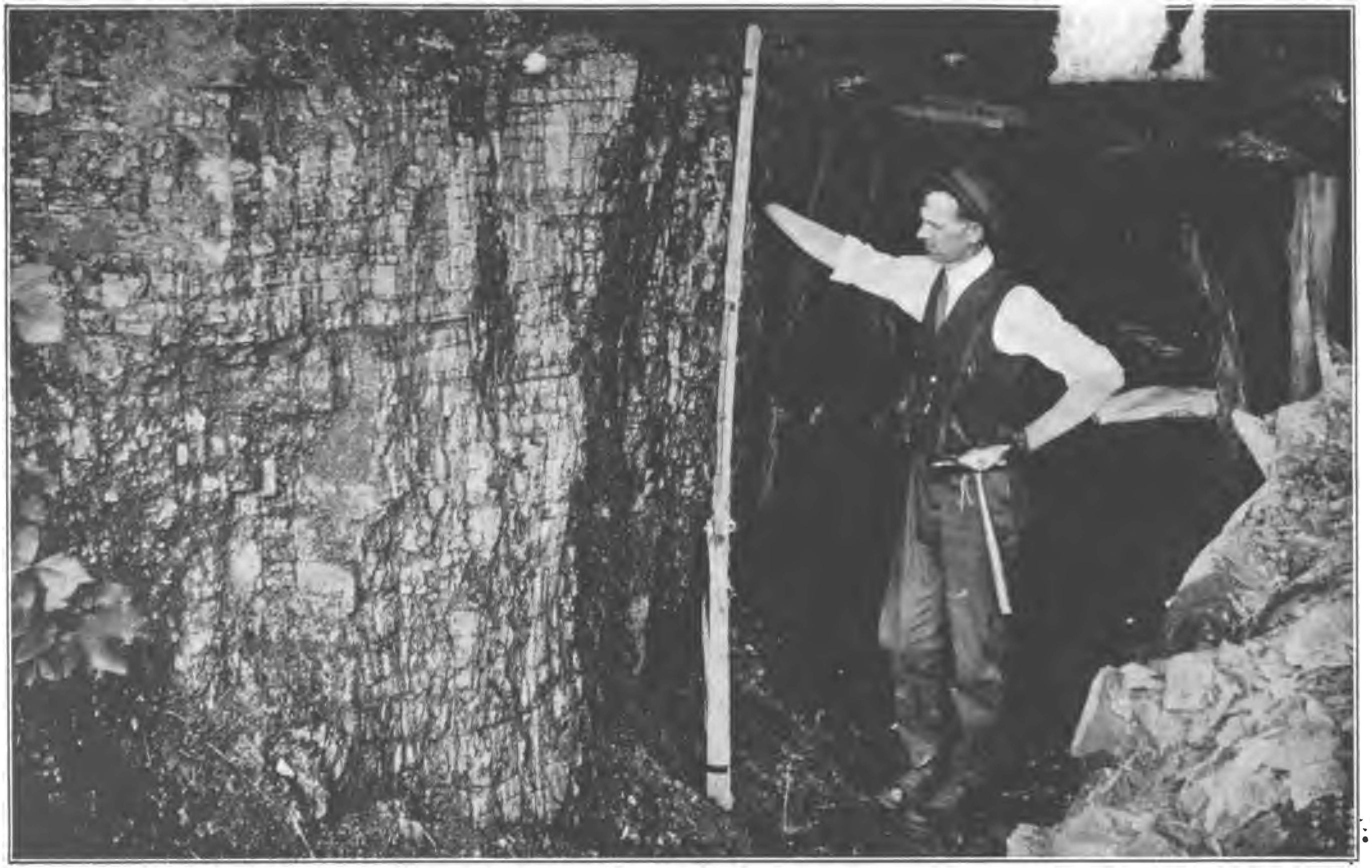

PLATE III.—Pittsburgh Coal seam at Winford Knight Farm Mine (No. 112 on Map II), one mile northeast of Pepper, Barbour County; total thickness of coal, 8′ 1″.

are usually streams that have the more nearly reached base-level:

Table of Stream Data.

STREAMS.	Total Distance. Miles.	Total Fall. Feet.	Rate of Fall per Mile. Feet.	Air-Line Distance Miles.	Ratio T. D. to A. L. D.
Tygart Valley River, Elkins to Belington	18.6	220	11.8	8.6	2.2
Tygart Valley River, Belington to Tygart Junction	11.7	360	30.8	9.1	1.3
Tygart Valley River, Tygart Junction to Big Sandy Creek	20.8	295	14.2	13.3	1.6
Pleasant Creek, first road fork to mouth	5.4	180	33.3	4.7	1.1
Sandy Creek, Colebank to Dent	4.8	145	30.2	4.0	1.2
Sandy Creek, Dent to mouth	8.1	275	34.0	5.0	1.6
Teter Creek, Kirt to Nestorville	6.5	445	68.5	5.0	1.3
Teter Creek, Nestorville to mouth	4.2	195	46.4	3.0	1.4
Laurel Creek, mouth Glady Creek to mouth	6.5	310	47.7	4.9	1.3
Glady Creek, Meadowville to mouth	3.6	40	11.1	2.9	1.2
Sugar Creek, Flora to mouth	6.0	50	8.3	4.2	1.4
Hackers Creek, Elk District Line to mouth	3.8	100	26.3	3.6	1.1
Beaver Creek, Tigheview to mouth	3.4	215	63.2	2.4	1.4
Zebs Creek, Grassy Fork to mouth	2.4	140	58.3	2.2	1.1
Roaring Creek, Mabie to Coalton	4.0	85	21.3	1.9	2.1
Roaring Creek, Coalton to mouth	3.5	290	82.9	2.9	1.2
Simpson Creek, Berryburg to Bartlett Run	4.4	290	65.9	4.0	1.1
Elk Creek, Indian Fork to Overfield	8.0	170	21.2	6.5	1.2
Elk Creek, Overfield to Gnatty Creek	4.0	30	7.5	3.6	1.1
Elk Creek, Gnatty Creek to Brushy Fork	7.0	35	5.0	4.9	1.4
Brushy Fork, Pepper to Glade Run	4.8	130	27.1	4.2	1.1
Brushy Fork, Glade Run to mouth	5.7	60	10.5	4.7	1.2
Gnatty Creek, Peeltree to mouth	6.1	50	8.2	4.3	1.4
Rooting Creek, Harrison Co. Line to mouth	5.1	75	14.7	4.5	1.1
Middle Fork River, forks to Yokum	8.4	40	4.8	5.9	1.4
Middle Fork River, Yokum to mouth	9.0	310	34.4	6.1	1.5
Right Fork, Hemlock to Queen	6.3	465	73.8	5.1	1.2
Right Fork, Queen to mouth	4.5	80	17.8	3.2	1.4
Left Fork, Adolph to Cassity	6.8	300	44.1	5.7	1.2
Left Fork, Cassity to mouth	8.0	170	21.2	6.3	1.3
Long Run, Loda to mouth	5.5	450	81.8	4.8	1.1
Buckhannon River, Alexander to Tenmile	9.1	225	24.7	6.5	1.4

Table of Stream Data (Continued).

STREAMS.	Total Distance. Miles.	Total Fall. Feet.	Rate of Fall per Mile. Feet.	Air-Line Distance Miles.	Ratio T. D. to A. L. D.
Buckhannon River, Tenmile to Fink Run	13.0	205	15.8	8.9	1.5
Buckhannon River, Fink Run to Century Junction	18.7	40	2.1	8.0	2.3
Buckhannon River, Century Junction to mouth	3.7	30	8.1	2.8	1.3
Big Run, Century to mouth	4.6	105	22.8	4.2	1.1
Pecks Run, Pecks Run to mouth	5.1	50	9.8	4.1	1.2
Sand Run, Benson School to Overhill	5.5	290	52.7	4.4	1.2
Sand Run, Overhill to mouth	6.5	190	29.2	4.8	1.4
Turkey Run, Coon Fork to mouth	3.0	30	10.0	2.7	1.1
Fink Run, Lorentz to mouth	5.0	45	9.0	4.1	1.2
French Creek, Frenchton to French Creek	4.3	60	14.0	3.4	1.3
French Creek, French Creek to mouth	8.9	15	1.7	4.8	1.9
Panther Fork, Stockerts to mouth	2.7	365	135.2	2.4	1.1
Left Fork of Buckhannon, Phillips Camp Run to Palace Valley	7.5	620	82.6	6.7	1.1
Left Fork of Buckhannon, Palace Valley to mouth	5.3	260	49.1	4.0	1.3
Right Fork of Buckhannon, Pickens to Newlon	9.5	790	83.2	6.3	1.5
Right Fork of Buckhannon, Newlon to mouth	3.8	165	43.7	2.8	1.4
Left Fork of Right Fork, Helvetia to Newlonton	6.5	340	52.3	3.3	2.0
Hackers Creek, Ruraldale to Berlin	7.8	90	11.5	6.8	1.1
Hackers Creek, Berlin to mouth	13.7	60	4.4	8.0	1.7
Jesse Run, Upshur County Line to mouth	6.3	190	30.2	5.0	1.3
Right Fork of Stonecoal Creek, Glady Fork to Horner	7.4	235	31.8	5.7	1.3
Little Kanawha River, Holly Grove to Stillman	3.6	205	56.9	3.0	1.2
Little Kanawha River, Stillman to Ingo	7.3	500	68.5	5.2	1.4
Little Kanawha River, Ingo to Wildcat	4.2	85	20.2	2.9	1.3
Right Fork, Rockcamp Run to Cleveland	5.0	670	134.0	3.8	1.3
Right Fork, Cleveland to Wildcat	5.2	330	63.4	3.5	1.5
Elk River, Valley Fork to Mill Run	3.7	150	40.5	3.4	1.1
Back Fork, Hewett Fork to Skelt	11.4	960	84.2	9.4	1.2
Sugar Creek, Anderson Camp to mouth	7.5	700	93.3	6.9	1.1

The following table, prepared by Teets, gives a planimetric determination of the areas of the different drainage basins of the territory of this report, the U. S. topographic sheets being used for authority:

Areas for Drainage Basins

Streams	Square Miles.
Tygart Valley River, entire	1435.00
Tygart Valley River, including Pleasant Creek	1205.00
Pleasant Creek	11.22
Sandy Creek	90.25
Big Cove Run	4.20
Teter Creek	47.30
Laurel Creek, total	54.00
Glady Creek	9.05
Sugar Creek	31.50
Hackers Creek	10.55
Beaver Creek	8.25
Zebs Creek	4.75
Roaring Creek	29.75
Simpson Creek	84.60
Elk Creek, including Brushy Fork	107.40
Brushy Fork	21.10
Gnatty Creek	33.90
Rooting Creek	12.45
Middle Fork River	151.20
Right Fork	31.00
Left Fork	78.75
Long Run	9.30
Cassity Fork	16.20
Buckhannon River	310.15
Big Run	6.60
Pecks Run	13.60
Sand Run	29.40
Turkey Run	8.75
Fink Run	16.65
Little Sand Run	5.70
French Creek	49.50
Laurel Fork	13.00
Tenmile Creek	8.50
Panther Fork	6.25
Left Fork of Buckhannon	37.40
Right Fork of Buckhannon	53.00
Left Fork of Right Fork	18.15
Hackers Creek of West Fork	54.40
Jesse Run	10.74
Right Fork of Stonecoal Creek	20.50
Little Kanawha River, both branches above Wildcat	98.80
Right Fork	36.70
Elk River above Mill Run	106.00
Back Fork	70.00
Sugar Creek	24.15

DESCRIPTION OF DRAINAGE BASINS.

Tygart Valley River.

The Tygart Valley River, which forms the principal drainage basin of Barbour and of a large portion of Randolph and Upshur, is a northward flowing stream, having its rise at Bald Knob, Pocahontas County, and, together with the West Fork, forming the Monongahela River at Fairmont. The tidal elevation at its source is approximately 4000 feet; at Elkins it is 1900 feet; at the Randolph-Barbour Line, 1750 feet; at the Barbour-Taylor Line, 1000 feet; and at Fairmont, 860 feet, a total fall of 3140 feet; and its length from head to mouth is 112 miles. Its early course in the mountains is rapid, but below Elkwater in western Randolph it reaches a practically base-leveled condition which continues as far as Elkins, the river valley being broad and straight with many meanders of the stream from side to side. Below Elkins, however, the river undergoes a great transformation from its previous placid course and again becomes a rough turbulent stream, littered with the debris from the Pottsville Rocks through which it has cut its way. For several miles north and south of Belington it is again quiet, due no doubt to the influence of the Belington Syncline which crosses it there. At Wilmoth Ford it again becomes rough and so remains all the way to Berryburg Junction below Philippi, after which a few miles of quiet water appear. From Arden to the Taylor Line it is rough and rapid,and from the Taylor Line to its mouth at Fairmont its prevailing character is turbulent, although there are a few quiet stretches. Nearly all of its course in Barbour is through the hard rocks of the Pottsville Series, great boulders from which litter its channel, making it one of the most picturesque streams in the State. The total area of its drainage basin is 1435 square miles, and of that portion above and including Pleasant Creek is 1205 square miles.

The principal tributaries in Barbour and western Randolph are Pleasant Creek, Big Sandy Creek, Big Cove Run, Teter Creek, Laurel Creek, Hackers Creek, Buckhannon River, Middle Fork River, Beaver Creek, Zebs Creek, and Roaring Creek.

The Water-Resources Branch of the U. S. Geological Survey has maintained a gaging station at Belington since 1907, the results of which, as published in Water-Supply Papers Nos. 243, 263, 283, 303, 323, 353, 383, and 403, are here assembled, as follows:

Discharge measurements of Tygart Valley River at Belington, W. Va., in 1907 and 1908.

Date	Hydrographer	Width	Area of section	Gage Height	Discharge
1907		*Feet*	*Sq.Ft.*	*Feet*	*Sec.-ft*
June 5	A. H. Horton	189	604	4.50	856
June 6	C. E. Langley	196	838	5.54	1,640
June 7	A. H. Horton	193	718	4.99	1,200
August 12	Horton and Padgett	186	468	3.73	459
September 16	A. H. Horton	174	349	3.14	233
1908					
August 2	W. G. Hoyt	180	303	2.87	147

Daily gage height, in feet, of Tygart Valley River at Belington, W. Va., for 1907.

[Observers, Charles Brandenburg and S. A. Campbell.]

Day.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	3.5	3.9	3.0	3.2	4.1	3.0
2	......	3.9	3.4	3.1	3.1	4.0	3.7
3	......	5.6	3.3	3.2	3.0	5.2	3.5
4	......	5.1	3.1	3.5	3.1	6.3	3.4
5	4.5	4.1	3.3	4.6	5.6	5.9	3.6
6	5.6	3.5	3.4	4.1	4.8	5.3	3.7
7	5.0	3.7	3.2	3.5	4.2	8.2	3.6
8	4.8	4.1	3.2	3.1	4.9	7.1	3.5
9	10.8	4.7	2.9	3.0	5.8	6.3	3.4
10	6.7	9.2	3.5	2.8	5.2	6.6	5.2
11	5.4	5.9	4.0	3.1	4.3	7.3	8.9
12	5.0	7.6	3.7	4.0	4.0	6.1	6.3
13	9.3	8.1	3.4	4.1	3.6	5.3	5.4
14	10.1	7.9	3.2	3.6	3.4	4.4	6.0
15	11.7	5.1	3.1	3.3	3.3	4.2	9.8
16	11.2	4.1	3.0	3.2	3.1	3.9	7.1
17	5.3	7.1	3.2	3.4	3.1	3.8	6.2
18	4.9	18.7	3.5	3.2	3.2	3.6	5.1
19	4.0	6.2	3.3	4.9	3.1	3.5	4.7
20	3.9	5.6	3.2	4.1	3.0	3.4	4.5
21	3.8	5.0	3.0	3.7	2.9	3.2	4.2
22	3.5	4.1	2.8	3.4	2.9	3.3	3.9
23	3.4	4.5	3.1	3.1	2.8	3.4	4.1
24	3.3	4.4	10.0	3.5	2.8	6.1	9.3
25	4.4	4.6	8.6	3.8	2.8	7.8	7.1
26	4.1	4.6	4.9	3.2	2.7	6.2	6.0
27	3.7	4.5	4.1	3.0	2.9	5.3	4.7
28	3.5	4.1	3.8	2.9	3.5	4.6	4.3
29	3.4	5.1	3.5	3.0	6.5	4.3	4.2
30	3.2	4.8	3.3	3.1	6.2	3.9	4.7
31	......	4.6	3.2	......	5.8	......	5.1

Daily gage height, in feet, of Tygart Valley River at Belington, W. Va., for 1908.

[Observers, Charles Brandenburg and S. A. Campbell.]

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.9	4.8	4.4	10.1	3.8	4.7	2.5	3.0	2.2	1.9	1.8	2.1
2	4.7	6.1	12.3	7.8	3.9	4.1	2.4	2.8	2.2	1.9	1.8	2.1
3	4.5	5.9	9.1	7.0	4.1	3.9	2.3	2.2	2.2	1.9	1.9	2.1
4	4.2	5.5	6.9	5.8	4.3	4.0	3.1	2.6	2.1	1.8	1.8	2.1
5	4.4	5.3	5.6	4.9	8.9	6.3	4.6	2.9	2.1	1.8	2.0	2.1
6	4.6	7.1	6.2	4.6	10.8	4.9	3.3	3.2	2.1	1.8	2.1	2.2
7	4.3	7.3	8.5	4.3	7.9	4.2	3.4	2.7	2.1	1.8	2.2	2.2
8	6.2	6.2	7.3	4.4	10.7	3.9	3.2	2.7	2.1	1.8	2.1	2.2
9	6.9	5.7	7.0	7.5	7.8	3.5	3.1	2.8	2.0	1.8	2.0	2.2
10	6.7	4.8	6.8	7.7	10.9	3.3	3.0	2.9	2.0	1.8	2.0	2.2
11	6.4	4.6	6.4	8.9	10.4	3.1	2.9	2.8	2.0	1.8	2.0	2.3
12	10.0	6.2	5.3	8.7	6.7	3.2	2.6	2.9	2.0	1.8	2.0	2.5
13	11.5	9.1	4.9	6.6	5.6	3.1	2.7	2.6	2.0	1.8	2.0	2.3
14	8.2	10.5	4.6	5.3	4.5	3.0	2.6	2.5	2.0	1.7	2.0	3.0
15	5.9	10.4	4.5	4.7	4.3	3.2	3.0	2.4	2.0	1.7	2.0	2.9
16	5.1	12.9	4.6	5.1	5.8	3.3	2.8	2.3	2.0	1.7	2.0	2.7
17	4.8	7.1	4.5	6.7	.....	3.4	2.6	2.3	1.9	1.8	2.0	2.6
18	4.5	6.2	4.7	5.6	4.2	3.0	3.0	2.3	1.9	1.8	2.0	2.5
19	4.8	5.3	5.8	5.8	4.7	2.9	3.4	2.2	1.9	1.8	2.0	2.5
20	4.2	5.2	8.3	6.5	7.3	3.1	2.9	2.2	1.9	1.8	2.0	2.3
21	4.3	4.9	6.5	5.7	8.2	3.2	2.8	2.2	1.9	1.8	2.0	3.0
22	4.5	4.4	5.1	4.8	7.4	3.3	3.2	2.2	1.9	1.8	2.0	2.7
23	5.9	4.1	4.8	4.5	6.2	3.1	3.2	2.2	1.8	1.8	2.0	2.3
24	5.6	4.0	4.7	3.9	4.9	3.0	3.3	2.2	1.8	1.8	2.0	2.7
25	5.4	3.8	4.5	3.8	4.6	2.9	3.9	2.0	1.8	1.8	2.0	2.6
26	4.2	3.9	4.3	4.1	6.4	2.9	5.9	2.3	1.8	1.8	2.0	2.6
27	6.3	4.5	4.0	4.2	5.2	2.8	6.9	2.3	1.8	1.8	2.0	2.6
28	6.6	4.3	4.1	4.3	4.5	2.8	4.6	2.4	1.8	1.8	2.0	2.6
29	5.7	4.0	4.6	4.0	4.1	2.7	4.1	2.6	1.8	1.8	2.0	2.6
30	5.4	.....	6.5	3.9	3.3	2.6	3.6	2.5	1.9	1.9	2.1	2.6
31	4.5	.....	6.4	.....	6.2	.....	3.3	2.3	.....	1.8	.....	2.9

Discharge measurements of Tygart Valley River at Belington, W. Va., in 1909.

Date	Hydrographer	Width	Area of section	Gage Height	Discharge
		Feet	*Sq.Ft.*	*Feet*	*Sec.-ft*
May 20..........	A. H. Horton........................	180	327	3.05	302
November 17....	A. H. Horton........................	186	395	3.44	328
December 4......	G. L. Parker........................	186	342	3.11	308

Daily gage height, in feet, of Tygart Valley River at Belington, W. Va., for 1909.

[S. A. Campbell, Observer.]

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.0	3.7	5.0	4.8	5.7	2.8	3.6	6.4	2.6	2.6	3.2	3.3
2	3.7	3.7	4.7	4.5	5.5	3.1	3.2	4.1	2.5	2.5	3.1	3.2
3	3.6	3.6	4.4	5.1	5.1	3.3	2.9	3.7	2.4	2.5	3.2	3.2
4	3.0	3.5	6.1	5.7	5.3	3.0	2.9	3.3	2.5	2.4	3.1	3.1
5	2.9	3.5	5.5	6.1	5.1	3.0	2.7	3.1	2.5	2.4	2.9	3.1
6	2.9	3.9	5.1	6.3	4.7	5.0	2.5	2.9	2.6	2.3	2.9	3.0
7	3.7	4.1	5.8	5.5	4.5	4.2	2.5	3.0	2.6	2.3	2.9	3.1
8	3.4	4.6	7.8	4.9	4.0	4.8	2.5	2.8	2.5	2.3	2.8	3.1
9	3.3	4.0	6.7	4.8	3.9	7.0	2.5	2.6	2.5	2.3	2.8	3.1
10	3.2	5.8	6.3	4.0	3.7	5.4	2.5	2.6	2.6	2.3	7.5	3.0
11	3.0	7.4	6.0	3.9	4.2	5.8	2.4	2.5	4.2	2.2	6.6	3.0
12	2.9	5.5	5.0	3.7	4.5	5.3	2.3	2.5	3.8	3.8	5.2	2.6
13	3.0	4.7	4.5	3.6	4.1	4.9	2.3	2.4	3.0	4.0	4.4	3.0
14	3.3	4.9	4.6	7.5	3.9	4.8	2.3	2.3	2.7	3.4	4.1	4.5
15	6.4	5.2	4.9	9.9	3.7	4.0	2.5	2.3	2.6	3.1	3.6	5.3
16	7.0	5.3	4.5	6.2	3.5	4.2	2.7	3.7	4.5	3.4	3.5	4.5
17	6.4	6.1	4.8	5.0	3.4	4.2	2.6	4.6	5.0	3.2	3.4	4.0
18	5.8	5.5	4.0	4.5	3.2	7.5	2.5	4.1	3.6	3.4	3.3	3.7
19	4.2	4.9	3.7	4.0	3.0	5.7	2.4	3.5	3.4	4.0	3.2	4.0
20	4.0	4.7	3.8	3.9	3.0	4.9	2.4	3.2	3.0	4.3	3.2	4.7
21	4.0	5.0	3.5	6.1	3.1	3.7	2.4	3.4	2.8	4.5	3.1	4.3
22	3.8	5.5	3.7	8.1	3.3	3.5	2.3	3.3	2.7	3.7	3.1	4.6
23	3.6	5.4	3.7	8.2	3.3	3.2	2.5	3.2	2.6	3.6	3.2	4.4
24	3.5	5.4	3.6	8.9	3.3	3.1	3.0	3.0	3.4	10.2	3.3	4.0
25	3.5	6.7	3.7	7.0	3.2	3.0	3.0	2.8	2.7	6.4	4.0	4.9
26	3.5	6.1	4.2	5.7	3.1	2.9	2.9	2.6	2.9	5.1	3.8	4.1
27	3.4	5.7	5.2	5.7	3.1	2.7	2.7	2.5	3.0	4.1	3.6	4.0
28	3.3	5.4	5.8	5.3	3.2	3.4	2.7	2.5	2.9	4.0	3.5	4.1
29	3.2	.....	6.1	5.4	3.3	3.4	2.6	2.4	2.8	3.7	3.3	4.0
30	3.2	.....	5.5	5.0	3.2	3.1	2.6	2.1	2.7	3.5	3.3	3.8
31	3.4	.....	5.1	.....	3.0	.....	3.1	2.8	.....	3.4	.....	3.5

Discharge measurements of Tygart Valley River at Belington, W. Va., in 1910.

Date	Hydrographer	Width	Area of section	Gage Height	Discharge
		Feet	*Sq.Ft.*	*Feet*	*Sec.-ft*
February 17	C. T. Bailey	213	1 560	9.08	5,360
February 20	C. T. Bailey	200	813	5.46	1,420
February 20	C. T. Bailey	200	757	5.15	1,100
August 22	C. T. Bailey	180	212	2.44	75.5
October 10	C. T. Bailey	178	194	2.29	22.4

Daily gage height, in feet, of Tygart Valley River at Belington, W. Va., for 1910.

[S. A. Campbell, Observer.]

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.6	4.2	4.9	3.0	3.8	3.7	3.1	3.0	2.2	2.8	2.7	3.9
2	4.1	3.8	5.4	3.0	3.6	4.5	3.1	2.8	2.2	2.6	2.7	3.7
3	11.4	4.8	5.0	3.0	3.5	4.8	3.0	2.6	2.8	2.5	2.7	3.8
4	10.3	5.0	4.7	3.0	3.6	5.0	3.3	2.7	2.3	2.5	2.7	3.5
5	6.6	5.0	4.4	3.2	3.4	5.3	3.6	2.6	2.8	2.4	2.7	3.1
6	5.6	5.2	4.2	3.2	3.2	8.8	3.9	2.6	3.0	2.3	2.6	3.8
7	9.3	6.8	4.0	3.1	3.2	7.9	3.4	2.6	3.3	2.2	2.6	3.7
8	8.8	6.2	3.9	3.2	3.2	5.7	3.6	2.5	3.0	2.2	2.5	3.6
9	7.5	6.2	3.7	3.1	3.6	4.8	3.9	2.4	2.9	2.2	2 5	3.6
10	4.8	7.8	3.5	3.0	4.1	4.8	3.8	2.5	2.8	2.2	2.5	3.5
11	4.1	7.9	3.5	3.0	4.0	5.8	3.8	2.4	2.7	2.7	2.5	3.3
12	3.9	8.3	3.5	3.0	5.4	6.8	3.2	2.4	2.6	2.6	2.5	3.3
13	3.9	7.8	3.4	3.0	8.3	7.2	4.0	2.3	2.5	2.4	2.4	3.3
14	4.8	7.8	3.4	3.3	5.9	6.3	5.5	2.4	3.0	2.4	2.3	3.3
15	6.4	7.8	3.4	3.5	5.4	5.7	4.7	2.4	3.4	2.3	2.3	3.2
16	4.9	10.6	3.4	3.4	4.2	10.35	4.1	2.2	3.0	2.3	2.4	3.0
17	4.6	9.0	3.3	3.4	3.9	14.15	4.1	2.2	2.8	2.2	2.3	3.0
18	5.3	8.4	3.3	3.4	3.8	11.5	4.4	2.2	2.7	2.2	2.4	3.1
19	10.8	7.1	3.2	3.8	3.7	11.4	4.2	2.0	2.6	2.2	2.4	3.2
20	7.5	5.5	3.2	4.0	3.6	11.4	3.7	2.1	2.5	2.2	2.4	3.3
21	5.8	5.2	3.1	4.0	3.6	6.5	3.3	2.1	2.5	2.1	2.4	4.3
22	8.0	6.8	3.3	4.6	3.5	6.5	3.2	2.5	2.4	2.2	2.4	3.8
23	7.5	8.2	3.3	5.1	3.4	6.0	3.0	2.6	2.4	2.2	2.4	3.6
24	5.2	6.1	3.2	4.8	3.4	4.8	2.8	2.4	2.3	2.2	2.4	4.8
25	4.6	5.1	3.2	6.6	4.3	4.0	2.8	2.6	2.3	2.7	2.5	6.6
26	4.2	4.6	3.2	5.9	5.1	3.9	2.7	2.6	2.3	2.5	2.8	6.4
27	5.0	4.4	3.1	5.4	4.4	3.5	2.6	2.4	2.3	2.5	2.8	5.4
28	6.8	4.1	3.1	4.8	4.0	3.4	2.8	2.3	2.5	2.5	3.3	4.7
29	5.7	.....	3.1	4.4	3.8	4.0	2.9	2.2	3.0	2.6	5.4	4.6
30	5.4	.....	3.0	4.0	3.5	3.3	3.2	2.2	3.0	2.7	4.2	7.4
31	4.6	.....	3.0	.....	3.5	.....	3.0	2.2	.....	2.8	.....	7.8

NOTE.—Relation of gage height to discharge affected by ice about Jan. 1 and 2, Feb. 5 to 16, and Dec. 6 to 24. Observer reported ice gorged Feb. 10 to 16.

Daily discharge, in second-feet, of Tygart Valley River at Belington, W. Va., for 1907-1910.

Day.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1907							
1	......	363	546	183	246	644	546
2	......	546	321	213	213	595	452
3	......	1,500	282	246	183	1,250	363
4	......	1,190	213	363	213	2,000	321
5	850	644	282	904	1,500	1,700	407
6	1,500	363	321	644	1 020	1,310	452
7	1,130	452	246	363	694	3.620	407
8	1,020	644	246	213	1,070	2,620	363
9	6.410	959	156	183	1,630	2,000	321
10	2 300	4,620	363	132	1,250	2,230	1,25

Daily discharge, in second-feet, of Tygart Valley River at Belington, W. Va., for 1907-1910—Continued.

Day.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
11	1,370	1,700	595	213	745	2,790	4,310
12	1,130	3,050	452	595	595	1,850	2,000
13	4,730	3,520	321	644	407	1,310	1,870
14	5,610	3,320	246	407	321	797	1,780
15	7,470	1,190	213	282	282	694	4,730
16	6,870	644	183	246	213	546	2,620
17	1,310	2,620	246	321	213	498	1,920
18	1,070	16,500	363	246	246	407	1,190
19	595	1,920	282	1,070	213	363	959
20	546	1,500	246	644	183	321	850
21	498	1,130	183	452	156	246	694
22	363	644	132	321	156	282	546
23	321	850	213	213	132	321	644
24	282	797	5,500	363	132	1,850	4,730
25	797	904	4,010	498	132	3,230	2,620
26	644	904	1,070	246	110	1,920	1,780
27	452	850	644	183	156	1,310	959
28	363	644	498	156	363	904	745
29	321	1,190	363	183	2,150	745	694
30	246	1.020	282	213	1,920	546	950
31	......	904	246	......	1,630	......	1.190

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1908												
1	1,070	745	797	5 610	498	959	73	183	36	12	7	26
2	959	1,850	3,190	3,230	546	644	59	132	36	12	7	26
3	850	1,700	4,520	2,540	644	546	47	36	36	12	12	26
4	694	1,440	2,460	1,630	745	595	213	90	26	7	7	26
5	797	1,310	1,500	1,070	4,310	2,000	904	156	26	7	18	26
6	904	2 620	1,920	904	6,410	1,070	498	246	26	7	26	36
7	745	2,790	3,910	745	3,320	694	321	110	26	7	36	36
8	1,920	1,920	2,790	797	6,300	546	246	110	26	7	26	36
9	2,460	1,560	2,540	2 960	3,230	363	213	132	18	7	18	36
10	2,300	1,020	2,380	3,140	6,520	282	183	156	18	7	18	36
11	2,070	904	2,070	4,310	5,950	213	156	132	18	7	18	47
12	5,500	1,920	1,310	4,110	2,300	246	90	156	18	7	18	73
13	7,230	4,520	1,070	2,230	1,500	213	110	90	18	7	18	132
14	3,620	6,060	904	1,310	850	183	90	73	18	4	18	183
15	1.700	5,950	850	959	745	246	183	59	18	4	18	156
16	1,190	8,920	904	1,190	1,630	282	132	47	18	4	18	110
17	1,020	2,620	850	2,300	1.130	321	90	47	12	7	18	90
18	850	1,920	959	1,500	694	183	183	47	12	7	18	73
19	745	1,310	1.630	1,630	959	156	321	36	12	7	18	73
20	694	1,250	3,710	2,150	2,790	213	156	36	12	7	18	132
21	745	1,070	2,150	1,560	3,620	246	132	36	12	7	18	183
22	850	797	1,190	1,020	2,870	282	246	36	12	7	18	110
23	1,700	644	1,020	850	1,920	213	246	36	7	7	18	132
24	1,500	595	959	546	1,070	183	282	36	7	7	18	110
25	1,370	498	850	498	904	156	546	18	7	7	18	90
26	694	546	745	644	2,070	156	1,700	47	7	7	18	90
27	2,000	850	595	694	1,250	132	2,460	47	7	7	18	90
28	2,230	745	644	745	850	132	904	59	7	7	18	90
29	1,560	595	904	595	644	110	644	90	7	7	18	90
30	1 370	.....	2,150	546	3,710	90	407	73	12	12	26	90
31	850	.....	2,070	.....	1,920	.....	282	...47	.....	7	.....	156

Daily discharge, in second-feet, of Tygart Valley River at Belington, W. Va., for 1907-1910—Continued.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1909												
1	183	180	1,130	1,020	1,560	132	407	2,070	90	90	246	282
2	452	160	959	850	1,440	213	246	644	73	73	213	246
3	407	140	797	1,190	1,190	282	156	452	59	73	246	246
4	183	250	1,850	1,560	1,310	183	156	282	73	59	213	213
5	156	300	1,440	1,850	1,190	183	110	213	73	59	156	213
6	156	546	1,190	2,000	959	1,130	73	156	90	47	156	183
7	452	644	1,630	1,440	850	694	73	183	90	47	156	213
8	321	904	3,230	1,070	595	1,020	73	132	73	47	132	213
9	282	595	2,300	745	546	2,540	73	90	73	47	132	213
10	246	1,630	2,000	595	452	1,370	73	90	90	47	2,960	183
11	183	2,870	1.780	546	694	1,630	59	73	694	36	2,230	183
12	156	1,440	1,130	452	850	1,310	47	73	498	282	1,250	183
13	183	959	850	407	644	1,070	47	59	183	595	797	183
14	282	1,070	904	2,960	546	745	47	47	110	321	644	850
15	2,070	1,250	1,070	5,390	452	595	73	47	90	213	407	1,310
16	2,540	1,310	850	1,920	363	694	110	452	850	321	363	850
17	2,070	1 850	745	1,130	321	694	90	904	1,700	246	321	595
18	1,630	1,440	595	850	246	2,960	73	644	407	321	282	452
19	694	1,070	452	595	183	1,560	59	363	321	595	246	.....
20	595	959	498	546	183	1,070	59	246	183	745	246	.....
21	595	1,130	498	1,850	213	452	59	321	132	850	213	.....
22	498	1,440	452	3,520	282	363	47	282	110	452	213	.....
23	407	1,370	452	3,620	282	246	73	246	90	407	246	.....
24	363	1,370	407	4,310	282	213	183	183	321	5,720	282	.....
25	363	2,300	452	2,540	246	183	183	132	110	2,070	595	.....
26	363	1,850	694	1,560	213	156	156	90	156	1,190	498	.....
27	321	1,560	1,250	1,560	213	110	110	73	183	644	407	.....
28	282	1,370	1,630	1,310	246	321	110	73	156	595	363	.....
29	246	.....	1,850	1,370	282	321	90	59	132	452	282	.....
30	220	.....	1,440	1,130	246	213	90	26	110	363	282	.....
31	200	.....	1,190	.....	183	.....	3,520	132	.....	321	.....	.....

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1910												
1	100	694	1,070	183	498	452	213	183	36	132	110	546
2	400	498	1 370	183	407	850	213	132	36	90	110	452
3	7,110	745	1,130	183	363	1,020	183	90	47	73	110	498
4	5,840	1,130	959	183	407	1,130	282	110	47	73	110	363
5	2,230	.....	797	246	321	1,310	407	90	132	59	110	213
6	1.500	.....	694	246	246	4,210	546	90	183	47	90	.....
7	4,730	.....	595	213	246	3,320	321	90	282	36	90	.....
8	2,710	.....	546	246	246	1,560	407	73	183	36	73	.....
9	2,960	.....	452	213	407	1,020	546	59	156	36	73	.....
10	1,020	.....	363	183	644	1,020	498	73	132	36	73	.....
11	644	.....	363	183	595	1,310	498	59	110	110	73	.....
12	546	.....	363	183	1,370	2,380	246	59	90	90	73	.....
13	546	.....	321	183	3,710	2,700	595	47	73	59	59	.....
14	1,020	.....	321	282	1,700	2,000	1,440	59	183	59	47	.....
15	2,070	.....	321	363	1,370	1,560	959	59	321	47	47	.....
16	1,070	.....	321	321	694	5,890	644	36	183	47	59	.....
17	904	4,410	282	321	546	10.500	644	36	132	36	47	.....
18	1,310	3,810	282	321	498	7,230	797	36	110	36	59	.....
19	6,410	2,620	246	498	452	7,110	694	18	90	36	59	.....
20	2,960	1.440	246	595	407	7,110	452	26	73	36	59	.....

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
21	1,630	1,250	213	595	407	2,150	282	26	73	26	59	.....
22	3,420	2,380	282	904	363	2,150	246	73	59	36	59	.....
23	2,960	3,620	282	1,190	321	1,780	183	90	59	36	59	.....
24	1,250	1,850	246	1,020	321	1,020	182	59	47	36	59	.....
25	904	1,190	246	2,230	745	595	132	90	47	110	73	2,230
26	694	904	246	1,700	1,100	546	110	90	47	73	182	2,070
27	1,130	797	213	1,370	797	363	90	59	47	73	182	1,370
28	2,380	644	213	1,020	595	321	132	47	73	73	282	959
29	1,560	.....	213	797	498	595	156	36	183	90	1,370	904
30	1,370	.....	183	595	363	282	246	36	183	110	694	2,870
31	904	.....	183	.....	363	.....	183	36	.....	182	.....	2,230

NOTE.—Daily discharge determined by means of a discharge rating curve poorly defined up to 36 second-feet (gage height 2.2 feet), well defined between 47 to 2,150 second feet (gage height 2.3 and 6.5 feet), and poorly defined above 2,230 second-feet (gage height 6.6 feet). No notes relative to ice were kept by the gage observer during 1907 and 1908. From a study of climatologic data for the winter periods it appears that the relation of gage height to discharge was not affected by ice during 1907 and 1908. Daily discharge determinations for November, 1908, are probably much too high.

Daily discharge Jan. 30 to Feb. 5, 1909 and Dec. 19 to 31, 1909, estimated because of ice, from climatologic records and run-off in adjacent drainage areas. Mean discharge Dec. 19 to 31, 1909, estimated 135 second-feet.

Daily discharge Jan. 1 and 2, Feb. 5 to 16, and Dec. 6 to 24, 1910, estimated, because of ice, from climatologic records, discharge of adjacent drainage areas, and gage observer's notes. Mean discharge Feb. 5 to 16, 1910, estimated about 833 second-feet, varying from about 400 to 3,000 second-feet. Mean discharge Dec. 6 to 24, 1910, estimated about 100 second-feet, varying from about 50 to 300 second-feet.

Monthly discharge of Tygart Valley River at Belington, W. Va., for 1907-1910.

[Drainage area, 390 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area)	Accuracy
	Maximum	Minimum	Mean	Per square mile		
1907.						
June 5-30	7.470	246	1,850	4.74	4.58	B.
July	16,500	363	1,840	4.72	5.44	B.
August	5,500	132	621	1.59	1.83	A.
September	1,070	132	365	.936	1.04	A.
October	2,150	110	596	1.53	1.76	A.
November	3,620	246	1,300	3.33	3.72	A.
December	4,730	321	1,360	3.49	4.02	A.
1908.						
January	7,230	694	1,680	4.31	4.97	A.
February	8,920	498	2,020	5.18	5.59	B.
March	8,190	595	1,890	4.85	5.59	A.
April	5,610	498	1,730	4.44	4.95	A.
May	6 520	498	2,320	5.95	6.86	B.
June	2,000	90	388	.995	1.11	A.
July	2,460	47	391	1.00	1.15	A.
August	246	18	33.8	.215	.25	B.

Monthly discharge of Tygart Valley River at Belington, W. Va., for 1907-1910 (Continued).

Month.	Discharge in second feet.				Run-off (depth in inches on drainage area)	Acurracy
	Maximum	Minimum	Mean	Per square mile		
September	36	7	17.2	.044	.05	C.
October	12	7	7.35	.019	.02	D.
November	36	7	18.1	.046	.05	D.
December	183	26	84.2	.216	.25	C.
The year	3,920	7	884	2.27	30.84	
1909.						
January	2,540	156	552	1.42	1.64	B.
February	2,870	[a]140	1,140	2.92	3.04	B.
March	3,230	407	1,150	2.95	3.40	A.
April	5,390	407	1,660	4.26	4.75	A.
May	1,560	183	557	1.43	1.65	A.
June	2,960	110	755	1.94	2.16	A.
July	3.520	47	217	.556	.64	A.
August	4,070	26	285	.731	.84	A.
September	1,700	59	244	.626	.70	A.
October	5,720	36	559	1.43	1.65	B.
November	2 960	132	493	1.26	1.41	A.
December	1,310	....	276	.708	.82	C.
The year	5,720	....	652	1.67	22.70	
1910.						
January	7,110	[b]100	2,110	5.41	6.24	B.
February	4,410	....	1,360	3.49	3.63	C.
March	1,370	183	437	1.12	1.29	A.
April	2,230	183	558	1.43	1.60	A.
May	3,710	246	680	1.74	2.01	A.
June	10,500	282	2,450	6.28	7.01	B.
July	1,440	90	402	1.03	1.19	A.
August	188	18	66.7	.171	.20	B.
September	321	36	114	.292	.33	A.
October	132	26	63.5	.163	.19	B.
November	1,370	47	148	.379	.42	B.
December	3,230	....	568	1.46	1.68	D.
The year	10.500	18	740	1.90	25.79	

[a] February, 1909, mimimum discharge estimated.

[b] January, 1910, minimum discharge estimated.

NOTE.—See foot-notes to tables of daily discharge for notes relative to estimated periods.

Discharge measurements of Tygart Valley River at Belington, W. Va., in 1911.

Date	Hydrographer	Gage Height	Discharge
		Feet	*Sec.-ft*
January 17	C. T. Bailey	6.38	2,000
February 1	C. T. Bailey	6.43	2,080
November 1	R. Perwien	3.14	227

Daily gage height, in feet, of Tygart Valley River at Belington, W. Va., for 1911.

[S. A. Campbell, Observer.]

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.0	6.7	5.0	5.6	3.8	2.8	3.0	2.1	7.3	4.3	3.1	4.17
2	7.2	6.3	4.7	5.4	3.7	2.7	2.9	2.1	4.7	5.5	3.03	3.95
3	7.6	6.0	4.1	5.2	3.6	2.6	2.8	2.1	4.1	9.9	2.90	3.84
4	7.8	5.3	4.0	6.7	3.6	2.5	2.6	2.1	3.4	6.2	2.97	3.72
5	6.0	5.1	4.0	10.1	3.5	2.5	2.5	2.3	3.1	4.9	2.91	3.56
6	4.8	4.5	3.9	8.2	3.4	2.4	2.8	3.1	3.3	4.2	2.86	3.45
7	4.5	4.5	7.8	6.4	3.4	2.5	2.6	2.7	2.9	4.1	3.21	3.40
8	4.2	4.4	6.3	6.4	3.3	4.2	3.6	2.5	2.9	12.3	6.50	3.40
9	3.8	4.4	6.0	6.6	3.3	3.6	3.4	2.5	2.9	8.4	5.00	3.40
10	3.9	4.9	6.0	7.2	3.3	3.2	3.3	2.6	2.9	5.2	4.35	3.43
11	3.7	4.5	6.3	5.7	3.2	3.2	3.0	2.5	3.0	5.4	3.93	3.47
12	4.6	4.2	6.3	5.2	3.1	3.3	4.0	2.4	4.4	7.0	3.82	3.39
13	7.0	4.0	6.6	4.4	3.0	3.0	3.5	2.3	5.0	5.7	3.70	3.45
14	10.8	3.8	6.7	4.1	3.0	3.5	3.0	2.2	4.2	4.9	3.84	3.47
15	7.2	3.8	6.6	6.4	2.9	3.2	2.8	2.5	4.2	6.2	3.80	3.50
16	9.0	3.7	6.1	6.0	2.8	3.0	2.6	2.5	12.1	7.0	3.90	4.26
17	7.4	3.5	5.2	5.4	2.8	2.9	2.6	2.5	11.7	5.6	3.97	4.84
18	5.2	3.4	4.9	4.8	2.8	5.8	2.5	2.3	6.1	9.0	4.21	5.16
19	4.6	3.4	5.2	4.4	2.8	5.3	2.4	2.2	4.6	9.4	4.62	4.50
20	4.2	4.1	6.6	4.7	3.3	3.7	2.3	2.2	4.1	6.1	5.44	4.09
21	4.1	4.8	6.5	7.0	3.2	3.6	2.4	2.2	3.7	5.0	4.63	3.98
22	7.2	4.4	6.3	7.2	3.0	3.3	2.4	2.0	4.2	4.7	4.21	3.82
23	6.9	4.0	5.0	6.3	2.8	3.0	2.4	2.0	4.7	4.2	3.97	3.95
24	5.5	3.9	4.9	6.4	2.8	2.8	2.4	2.0	4.2	4.3	3.76	4.28
25	5.0	4.0	4.6	5.8	2.6	4.2	2.3	2.0	3.6	4.0	4.05	5.35
26	4.9	4.4	4.4	5.1	2.6	3.8	2.2	2.0	3.5	3.3	4.18	4.99
27	10.2	4.8	4.0	4.6	2.6	3.8	2.2	1.9	3.2	3.5	4.20	7.54
28	8.8	5.4	4.1	4.2	2.9	3.6	2.3	2.5	4.6	3.6	4.19	6.65
29	8.7	.....	4.0	4.0	2.7	3.2	2.1	2.9	4.2	3.4	4.40	5.40
30	13.7	.....	4.5	3.9	2.7	3.1	2.1	4.0	4.4	3.1	4.40	4.79
31	14.7	.....	6.4	.....	3.0	.....	2.2	10.2	.....	3.2	.....	6.32

NOTE.—No ice reported by observer. Relation of gage height to discharge probably not affected by ice during 1911.

Daily discharge, in second-feet, of Tygart Valley River at Belington, W. Va., for 1911.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,540	2,300	1,130	1.500	498	132	183	26	2,790	745	213	679
2	2,700	2,000	959	1,370	452	110	156	26	959	1,440	192	571
3	3,050	1,780	644	1,250	407	90	132	26	644	5,390	156	517
4	3,230	1,310	595	2,300	407	73	90	26	321	1,920	175	461
5	1,780	1,190	595	5,610	363	73	73	47	218	1,070	159	389

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
6	1,020	850	546	3,620	321	59	132	213	282	694	146	342
7	850	850	3,230	2,070	321	73	90	110	156	644	3,630	321
8	694	797	2,000	2,070	282	694	407	73	156	8,190	2,150	321
9	498	797	1,780	2,230	282	407	321	73	156	3,810	1,130	321
10	546	1,070	1,780	2,700	282	246	282	90	156	1,250	771	334
11	452	850	2,000	1,560	246	246	183	73	183	1,370	561	350
12	904	694	2,000	1,250	213	498	595	59	797	2,540	508	317
13	2,540	595	2,230	797	183	183	363	47	1,130	1,560	452	342
14	6,410	498	2,300	644	183	363	183	36	694	1,070	517	350
15	2,700	498	2,230	2,070	156	246	132	73	694	1,920	498	363
16	4.410	452	1,850	1,780	132	183	90	73	7,950	2,540	546	725
17	2,370	363	1,250	1,370	132	156	90	73	7,470	1,500	580	1,040
18	1,250	321	1,070	1,020	132	1,680	73	47	1,850	4,410	699	1,220
19	904	321	1,250	797	132	1,310	59	36	904	4,840	915	850
20	694	644	2,230	959	282	452	47	36	644	1,850	1,400	639
21	644	1,020	2,150	3,540	246	407	59	36	452	1,130	920	585
22	2,700	797	2,000	2 700	183	282	59	18	694	959	699	508
23	2,460	595	1,130	2,380	132	183	59	18	959	694	580	571
24	1,440	546	1,070	2,070	132	132	59	18	694	745	480	785
25	1,130	595	904	1,680	90	694	47	18	407	595	620	1,340
26	1,070	797	797	1,190	90	498	36	18	363	282	659	1,120
27	5,720	1,020	595	904	90	498	36	12	246	363	694	3,000
28	4,210	1,370	644	694	156	407	47	73	904	407	689	2,260
29	4,110	.....	595	595	110	246	26	156	694	321	797	1,370
30	9,920	.....	850	546	110	213	26	595	797	213	797	1,010
31	11,200	.....	2,070	.....	183	.....	36	5.720	.....	246	.....	2,010

NOTE.—Daily discharge determined from a discharge rating curve well defined between 73 and 2,540 second-feet (gage heights, 2.5 and 7.0 feet).

Monthly discharge of Tygart Valley River at Belington, W. Va., for 1911.

[Drainage area, 390 square miles.]

Month.	Discharge in second-feet. Maximum	Minimum	Mean	Per square mile	Run-off (depth in inches on drainage area)	Accuracy
January	11,200	452	2,730	7.00	8.07	B.
February	2,300	321	890	2.28	2.37	A.
March	3.230	546	1,430	3.67	4.23	A.
April	5,610	546	1,740	4.46	4.98	A.
May	498	90	223	.572	.66	A.
June	1,680	59	359	.921	1.03	A.
July	595	26	135	.346	.40	A.
August	5,720	12	256	.656	.76	B.
September	7,950	156	1,150	2.95	3.29	B.
October	8,190	213	1,760	4.51	5.20	B.
November	3,630	146	744	1.91	2.13	A.
December	3,000	317	805	2.06	2.38	A.
The year	11.200	12	1,020	2.62	35.50	

Daily gage height, in feet, of Tygart Valley River at Belington, W. Va., for 1912.

[S. A. Campbell, Observer.]

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.8	5.6	5.0	5.7	3.95	2.73	3.24	4.1	3.41	2.99	2.50	2.64
2	6.4	4.8	4.4	5.0	3.95	2.69	3.0	4.5	3.75	2.90	2.53	2.51
3	5.2	4.25	4.0	5.4	3.85	2.63	3.0	3.95	3.21	2.82	2.53	2.80
4	4.6	4.9	3.95	5.5	3.60	2.62	3.48	3.6	3.00	2.72	2.53	2.81
5	4.1	4.9	3.8	5.1	3.55	2.58	4.3	3.37	2.82	2.54	2.52	3.20
6	3.9	.....	3.7	4.7	3.49	2.54	4.6	3.19	2.70	2.51	2.49	4.1
7	3.43	.....	3.65	4.45	3.44	2.53	3.11	3.07	2.64	2.48	2.64	4.8
8	2.94	.....	3.75	4.2	4.8	2.50	3.23	2.97	2.52	2.48	6.7	4.0
9	2.83	4.3	4.45	4.3	5.7	2.46	3.38	2.87	2.51	2.44	5.6	3.85
10	4.7	4.0	4.6	4.15	4.8	2.40	3.9	2.82	2.46	2.40	4.6	3.65
11	4.25	3.9	4.7	4.0	4.2	2.44	3.55	2.78	2.37	2.35	3.7	3.40
12	4.25	3.85	4.35	3.8	5.5	2.28	3.85	2.75	2.30	2.35	4.45	3.27
13	4.25	.....	5.0	3.44	10.3	2.18	3.42	2.68	2.30	2.30	3.28	3.27
14	.....	.....	6.9	3.42	7.3	2.19	3.28	2.67	2.23	2.27	3.20	3.20
15	.....	.....	6.3	3.47	6.8	2.18	3.23	2.62	2.20	2.26	3.22	2.91
16	.....	3.6	12.2	3.38	6.4	2.28	3.7	2.57	2.46	2.23	3.15	2.88
17	.....	.....	8.4	4.45	12.0	2.62	3.75	2.54	2.57	2.23	3.06	2.90
18	.....	.....	6.0	4.45	7.1	3.6	3.8	2.53	2.57	2.22	3.00	2.92
19	9.9	.....	5.1	5.9	5.7	4.0	11.1	2.52	2.57	2.22	2.92	2.95
20	9.1	*a*5.5	5.4	4.8	5.0	4.0	6.3	2.67	2.42	2.22	2.86	2.85
21	7.6	6.3	6.7	4.35	4.45	4.05	6.2	3.40	2.44	2.22	2.84	2.82
22	5.1	7.8	7.9	4.0	4.0	3.5	8.9	3.38	2.38	2.44	2.80	2.81
23	4.6	6.3	7.0	4.0	3.7	3.55	11.7	3.19	2.31	2.50	2.78	2.80
24	4.5	5.9	7.0	4.7	3.5	3.6	5.7	3.17	4.6	2.50	2.64	2.90
25	4.4	5.4	9.0	4.8	3.34	4.6	17.4	2.99	5.5	2.64	2.57	2.80
26	4.0	5.2	7.2	4.0	3.19	5.6	13.8	2.06	4.45	2.87	2.70	2.75
27	3.75	11.6	7.5	3.85	3.08	4.4	6.0	2.87	3.65	2.86	2.64	2.89
28	3.9	9.2	4.9	3.75	2.98	3.8	5.2	3.39	3.34	2.78	2.61	3.12
29	5.0	5.9	5.0	3.75	2.93	3.6	4.05	2.97	3.21	2.70	2.50	3.65
30	9.7	.....	8.4	3.80	2.95	3.39	5.0	2.88	3.05	2.62	2.50	3.9
31	7.4	.....	7.5	.....	2.88	.....	4.7	3.21	.....	2.55	.....	10.2

*a*Gage height Feb. 20 to top of ice.

NOTE.—Relation of gage height to discharge affected by ice about Jan. 9-19 and about Feb. 4-20. Observer reported as follows: "Jan. 12, river at gage and at control frozen over; average thickness of ice, 6 inches. Jan. 19, ice going out; average thickness of ice, 8 inches. Feb. 5 to 16 river at gage and at control frozen over; average thickness of ice, 4 to 6 inches."

Daily discharge, in second-feet, of Tygart Valley River at Belington, W. Va., for 1912.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,210	1,500	1,130	1,560	570	117	260	679	350	197	84	110
2	2,070	1,020	797	1,130	570	108	183	896	505	172	89	86
3	1,250	720	595	1.370	522	96	183	603	269	151	89	146
4	904	.....	570	1,440	407	94	334	435	200	128	89	149
5	644	.....	498	1,190	385	87	745	333	151	91	88	265
6	546	.....	452	959	359	80	904	262	123	86	82	679
7	334	.....	430	824	338	78	216	222	110	81	110	1,070
8	167	.....	475	694	1 020	73	257	192	88	81	2,390	628
9	.....	.....	824	745	1,560	67	313	164	86	74	1,580	554
10	.....	.....	904	669	1,020	59	546	151	78	68	954	458

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
11	.....	.....	959	595	694	65	385	141	64	61	481	346
12	.....	.....	771	498	1,440	45	522	134	54	61	868	292
13	.....	.....	1,130	338	5,840	34	329	119	54	54	296	292
14	.....	.....	2,460	329	2,790	35	275	117	45	50	265	265
15	.....	.....	2,000	350	2,380	34	257	106	41	49	273	175
16	.....	.....	8,070	313	2,070	45	452	97	78	45	248	167
17	.....	.....	3,810	824	7,830	94	475	91	97	45	219	172
18	.....	.....	1,780	824	2,620	407	498	89	97	44	200	178
19	.....	.....	1,190	1.700	1,560	595	6,760	88	97	44	178	186
20	4,520	.....	1,370	1,020	1,130	595	2,000	117	71	44	162	159
21	3,050	2,000	2,300	771	824	620	1,920	346	74	44	156	151
22	1,190	3,230	3,320	595	595	363	4,310	338	65	74	146	149
23	904	2,000	2,540	595	452	385	7,470	262	55	84	130	146
24	850	1 700	2,540	959	363	407	1,560	255	954	84	110	172
25	797	1,370	4,410	745	298	904	14,700	197	1,520	110	97	146
26	595	1,250	2,700	595	243	1,500	10,000	25	868	164	123	134
27	475	7,350	2,960	522	207	797	1,860	164	458	162	110	169
28	546	4,620	1,070	475	178	498	1,320	342	321	141	104	238
29	1,130	1,700	1,130	475	164	407	654	192	269	123	84	458
30	5,170	.....	3,810	498	170	317	1,200	167	216	106	84	578
31	2,870	.....	2 960	.....	151	.....	1,010	269	.....	93	.....	5,720

NOTE.—Daily discharge computed from two rating curves fairly well defined between 40 and 2,500 second-feet and poorly defined above 2,500 second-feet. The 1907-1911 rating curve was used Jan. 1 to July 25, 1912, and a new curve from July 26 to Dec. 31, 1912. The change in rating curve is based on two discharge measurements made Sept. 4, 1912, and Mar. 30, 1913 (before the preparation of this report). The new curve was made to coincide with the old above 4,900 second-feet. See "Accuracy."

Discharge Jan. 9-19 and Feb. 4-20 estimated because of ice, from gage heights, observer's notes, climatologic records, and discharge of adjacent drainage areas, as follows: Jan. 9-10, 500 second-feet; Feb. 4-20, 400 second-feet. These estimates of discharge for periods when the relation of gage height to discharge is believed to have been affected by ice are based on insufficient data and therefore should be used with caution.

Monthly discharge of Tygart Valley River at Belington, W. Va., for 1912.

[Drainage area, 390 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area)	Accuracy
	Maximum	Minimum	Mean	Per square mile		
January	5,170	....	1,220	3.13	3.61	D.
February	7,350	....	1,220	3.13	3.38	D.
March	8,070	430	1,930	4.95	5.71	C.
April	1 700	313	787	2.02	2.25	B.
May	7,830	151	1,250	3.21	3.70	B.
June	1,500	34	300	.769	.86	B.
July	14,700	183	2,000	5.13	5.91	C.
August	896	25	245	.628	.72	B.
September	1,520	41	249	.638	.71	B.
October	197	44	90.7	.233	.27	C.
November	2,390	82	330	.846	.94	B.
December	5,720	86	466	1.19	1.37	B.
The year	14,700	....	842	2.16	29.43	

NOTE.—See foot-note to table of daily discharge.

Daily gage height, in feet, of Tygart Valley River at Belington, W. Va., for the year ending Sept. 30, 1913.

[S. A. Campbell, Observer.]

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	2.99	2.50	2.64	6.7	4.6	4.35	4.45	5.1	6.5	2.60	3.41	2.50
2	2.90	2.53	2.51	5.0	4.3	4.25	4.05	5.0	5.1	2.46	3.04	2.40
3	2.82	2.53	2.80	4.3	4.5	4.2	3.95	4.1	4.45	2.44	2.98	2.40
4	2.72	2.53	2.81	6.8	7.4	4.0	3.8	3.85	4.0	2.58	2.75	2.42
5	2.54	2.52	3.20	6.2	6.9	3.9	3.75	3.65	3.95	3.45	2.63	2.40
6	2.51	2.49	4.1	5.6	5.5	3.75	3.7	3.5	3.65	3.55	2.55	2.40
7	2.48	2.64	4.8	9.6	4.6	3.6	3.65	3.42	3.5	3.43	2.48	2.30
8	2.48	6.7	4.0	10.2	4.05	3.49	3.55	3.36	3.9	3.25	2.44	2.50
9	2.44	5.6	3.85	10.8	3.95	3.6	3.5	3.28	4.3	2.96	2.40	3.00
10	2.40	4.6	3.65	7.0	3.9	3.7	3.49	3.10	4.2	6.4	2.38	2.81
11	2.35	3.7	3.40	5.5	3.7	4.5	3.41	3.04	3.85	10.4	2.36	2.62
12	2.35	4.45	3.27	9.0	4.45	6.7	3.48	3.00	3.5	5.5	2.61	2.45
13	2.30	3.28	3.27	8.4	4.5	5.6	3.46	2.96	3.31	4.9	4.0	2.41
14	2.27	3.20	3.20	6.2	4.8	5.5	3.42	2.88	3.09	4.3	10.6	2.35
15	2.26	3.22	2.91	6.1	4.45	8.3	3.48	3.34	3.02	6.5	4.7	2.30
16	2.23	3.15	2.88	4.6	4.0	6.8	9.7	3.65	2.91	5.1	3.75	2.30
17	2.23	3.06	2.90	4.9	3.75	5.4	6.6	5.0	2.82	4.35	3.14	2.33
18	2.22	3.00	2.92	4.8	3.65	4.6	5.4	5.0	2.72	6.6	3.12	4.0
19	2.22	2.92	2.95	4.8	3.55	4.2	4.7	5.0	2.64	4.6	3.65	3.75
20	2.22	2.86	2.85	4.6	3.5	3.85	4.6	4.2	2.59	3.9	3.23	3.16
21	2.22	2.84	2.82	4.5	3.55	3.7	4.6	3.85	2.50	3.65	3.14	3.6
22	2.44	2.80	2.81	4.9	3.7	3.7	4.2	3.65	2.50	3.37	3.00	7.6
23	2.50	2.73	2.80	4.7	3.85	3.42	3.95	3.95	2.60	3.19	5.2	4.6
24	2.50	2.64	2.90	4.9	3.95	3.30	3.85	9.6	3.40	3.00	4.3	3.75
25	2.64	2.57	2.80	6.8	3.75	3.00	3.6	7.6	3.5	4.4	3.85	3.35
26	2.87	2.70	2.75	6.0	3.55	3.24	3.48	5.6	3.11	3.7	3.42	3.14
27	2.86	2.64	2.89	5.4	3.55	6.9	3.85	6.8	2.91	3.41	3.18	3.00
28	2.78	2.61	3.12	5.0	3.75	10.5	7.1	12.1	2.91	3.20	2.96	2.93
29	2.70	2.50	3.65	4.7	.....	6.8	5.8	9.5	2.81	3.65	2.90	2.55
30	2.62	2.50	3.9	4.3	.....	5.8	5.7	6.3	2.56	3.16	2.80	2.71
31	2.55	.....	10.2	4.1	.....	4.9	.....	7.8	.....	3.46	2.60	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

Daily discharge, in second-feet, of Tygart Valley River at Belington, W. Va., for the year ending Sept. 30, 1913.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	197	84	110	2,300	954	812	868	1,260	2,150	90	325	73
2	172	89	86	1,200	784	758	654	1,200	1,190	67	195	59
3	151	89	146	784	896	731	608	679	824	65	178	59
4	128	89	149	2,470	2,690	628	529	554	595	87	121	62
5	91	88	265	2,000	2,550	578	505	458	570	342	96	59
6	86	82	679	1,580	1.520	505	481	390	430	385	82	59
7	81	110	1,070	5,060	954	435	458	355	363	334	70	47
8	81	2,390	628	5,720	654	386	412	329	546	264	65	73
9	74	1,580	554	6,410	603	435	390	296	745	172	59	183
10	68	954	458	2,630	578	481	386	231	694	2,070	57	134

Daily discharge, in second-feet, of Tygart Valley River at Belington, W. Va., for the year ending Sept. 30, 1913 (Continued).

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
11	61	481	346	1,520	481	896	350	212	522	5,950	54	94
12	61	868	292	4,430	868	2,390	381	200	363	1,440	92	66
13	54	296	292	3,840	896	1,580	372	189	286	1,070	595	60
14	50	265	265	2,000	1.070	1,520	355	167	210	745	6,180	53
15	49	273	175	1,930	868	3,750	381	321	189	2,150	959	47
16	45	248	167	954	628	2,470	5,170	458	159	1,190	475	47
17	45	219	172	1,180	505	1,450	2,310	1,200	137	771	226	51
18	44	200	178	1,070	458	954	1,450	1,200	114	2,230	220	595
19	44	178	186	1,070	412	731	1,010	1,200	98	904	430	475
20	44	162	159	954	390	554	954	731	88	546	257	233
21	44	156	151	896	412	481	954	554	73	480	226	407
22	74	146	149	1,130	481	481	731	458	73	309	183	3,050
23	84	130	146	1,010	554	355	608	603	90	243	1,250	904
24	84	110	172	1,130	603	304	554	5,060	321	183	745	475
25	110	97	146	2,470	505	200	485	3,120	363	797	522	302
26	164	123	134	1,860	412	281	381	1,580	216	452	329	226
27	162	110	169	1.450	412	2,550	554	2,470	159	325	289	183
28	141	104	238	1,200	505	6,060	2,710	7,950	159	246	172	164
29	123	84	458	1,010	.....	2,470	1,720	4,950	134	430	156	82
30	106	84	578	784	.....	1,390	1,650	2,000	88	233	182	112
31	93	.....	5,720	679	.....	1,130	.....	3,230	.....	346	90	.....

Monthly discharge of Tygart Valley River at Belington, W. Va., for the year ending Sept. 30, 1913.

[Drainage area, 390 square miles.]

Month.	Discharge in second-feet. Maximum	Minimum	Mean	Per square mile	Run-off (depth in inches on drainage area)	Accuracy
October	197	44	90.7	0.233	0.27	C.
November	2,390	82	330	.846	.94	B.
December	5,720	86	466	1.19	1.37	B.
January	6,410	679	2,020	5.18	5.97	B.
February	2,960	390	818	2.10	2.19	B.
March	6,060	200	1,220	3.13	3.61	B.
April	5,170	350	944	2.42	2.70	C.
May	7,950	167	1.410	3.62	4.17	C.
June	2,150	73	398	1.02	1.14	B.
July	5,950	65	802	2.06	2.38	C.
August	6,180	54	477	1.22	1.41	C.
September	3,050	47	281	.721	.80	B.
The year	7,950	44	774	1.98	26.95	

Discharge measurements of Tygart Valley River at Belington, W. Va., during the year ending Sept. 30, 1914.

Date	Made by	Gage Height	Discharge
		Feet	*Sec.-ft*
November 6.....	Peterson and Walters..............................	3.07	178
November 6.....	Peterson and Walters..............................	3.04	190

Daily gage height, in feet, of Tygart Valley River at Belington, W. Va., for the year ending Sept. 30, 1914.

[S. A. Campbell, Observer.]

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	2.66	3.8	4.0	4.15	4.8	3.85	5.0	4.7	2.38	2.69	2.81	3.06
2	2.64	3.7	3.00	3.95	5.5	4.0	6.6	3.9	2.47	2.65	2.69	3.65
3	2.81	3.42	4.4	3.7	4.5	4.8	9.3	3.6	2.37	2.33	2.60	3.6
4	3.85	3.30	4.2	3.55	4.35	5.0	8.0	3.18	2.32	2.37	2.59	3.6
5	3.65	3.14	4.0	3.7	4.3	4.9	5.6	3.9	2.58	2.35	2.51	2.48
6	3.26	3.04	3.9	3.65	4.6	4.6	4.8	3.1	2.78	2.29	2.36	2.30
7	3.09	3.00	4.7	3.6	5.8	4.45	4.3	6.5	2.72	2.57	2.29	2.21
8	2.98	2.96	7.2	3.55	5.0	4.35	4.1	5.5	2.67	2.55	2.19	2.33
9	2.84	5.3	6.0	4.8	5.0	4.2	4.0	4.7	2.48	2.38	2.12	2.22
10	4.6	6.4	5.1	7.4	4.7	4.0	5.9	3.13	2.78	2.54	2.29	2.19
11	4.35	5.6	4.6	6.5	4.2	4.05	5.7	3.06	2.31	2.15	2.16	2.20
12	3.6	5.2	4.0	5.2	3.8	4.1	5.6	2.69	2.28	2.09	2.58	2.21
13	2.88	5.6	4.0	4.4	4.5	3.8	5.5	3.6	2.20	2.07	3.28	2.21
14	3.55	11.0	3.9	4.8	6.5	3.7	4.9	3.48	2.20	2.21	3.22	2.20
15	3.01	14.0	3.85	6.4	6.1	5.8	4.1	3.28	2.22	5.8	2.96	2.17
16	3.00	14.2	3.75	6.1	5.9	8.0	7.5	3.26	2.42	6.8	2.81	2.07
17	3.01	12.9	3.7	5.6	5.9	8.9	8.7	3.11	2.26	5.0	2.71	2.07
18	3.00	7.6	3.65	5.1	6.1	7.9	8.5	3.04	2.17	3.8	2.29	2.06
19	2.98	6.8	3.5	4.9	8.6	6.5	8.0	2.98	2.17	3.55	2.38	2.06
20	2.86	4.8	3.6	3.95	12.7	5.4	8.9	2.92	2.17	3.30	2.32	2.06
21	7.9	4.45	3.6	8.9	8.0	4.7	9.7	2.87	2.11	3.06	2.22	2.06
22	5.6	3.9	3.6	8.9	6.8	5.9	6.2	2.81	2.04	2.82	2.16	1.95
23	4.8	3.8	3.6	6.8	5.1	4.0	5.6	2.04	2.27	2.64	2.14	1.95
24	4.5	3.7	3.55	5.1	4.8	4.25	4.5	2.81	2.85	2.55	2.12	1.97
25	8.1	3.65	3.8	8.8	4.05	5.5	4.1	2.68	3.6	2.49	2.87	1.89
26	7.0	3.34	7.0	7.0	4.7	5.7	9.4	2.67	5.2	3.8	3.05	1.90
27	6.6	3.22	6.7	5.8	3.9	5.8	8.2	2.62	3.8	5.2	3.22	1.89
28	5.4	3.5	5.4	5.2	3.85	5.7	6.5	2.51	3.5	5.9	3.20	1.86
29	4.5	3.65	4.7	4.9	.....	5.8	5.6	2.47	3.07	4.2	2.94	2.89
30	4.05	3.42	4.45	4.8	.....	5.8	5.1	2.37	1.91	3.37	2.80	1.87
31	3.8	.....	4.4	4.8	.....	5.2	.....	2.37	.....	3.06	3.42	.....

NOTE.—Discharge relation probably not materially affected by ice during the year.

Tygart Valley River at Belington, W. Va.

Location.—At highway bridge at Belington, Barbour County, one-fourth mile above mouth of Mill Creek.

Drainage Area.—390 square miles.

Record Available.—June 5, 1907, to September 30, 1915.

Gage.—Chain gage attached to the upstream side of highway bridge to left of center of the river; read daily, in the morning, to hundredths, by S. A. Campbell. Sea-level elevation of zero of gage, 1,679.89 feet.

Discharge Measurements.—Made from upstream side of the bridge.

Channel and Control.—Practically permanent. Point of zero flow by leveling, August 22, 1910, at gage height about 1.6 feet; on November 6, 1913, this stage was found to be 1.4 feet ±0.2 foot.

Extremes of Stage.—Maximum stage recorded during year, 11.8 feet at 7 a. m., February 2, 1915; minimum stage, 1.70 feet October 2, 1914. Flood of July, 1912, reached gage height, 20.3 feet.

Winter Flow.—Ice may affect discharge relation for two or three weeks at a time during December, January, and February.

Accuracy.—Gage-height record reliable.

Estimates of discharge withheld for additional data.

The following discharge measurements were made by J. G. Mathers.

November 24, 1914: Gage height, 2.37 feet; discharge, 37 second-feet. Gage height, 2.34 feet; discharge, 34 second-feet.

Daily gage height, in feet, of Tygart Valley River at Belington, W. Va., for the year ending Sept. 30, 1915.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1.89	2.48	2.24	5.2	5.6	4.15	3.8	5.2	6.0	2.35	2.71	3.22
2	1.70	2.49	2.86	4.4	11.8	4.0	3.65	4.6	4.3	2.14	2.71	3.00
3	1.93	2.48	2.84	4.25	11.3	3.8	3.55	4.0	4.2	2.43	3.22	2.84
4	1.94	2.44	3.00	4.4	8.7	3.7	3.48	3.75	4.2	2.21	3.31	2.55
5	1.95	2.35	3.22	3.5	6.3	3.55	3.40	3.6	4.3	2.31	2.80	2.58
6	1.85	2.29	3.95	3.30	5.5	4.3	3.30	3.45	3.8	2.43	3.65	2.69
7	2.04	2.26	3.9	7.0	5.2	4.35	3.46	3.30	3.6	2.86	2.51	2.64
8	1.91	2.25	3.95	9.9	4.8	4.2	4.2	3.22	3.41	2.75	2.50	2.68
9	1.91	2.27	4.15	5.9	4.8	4.35	4.0	3.14	3.30	2.50	2.44	2.71
10	1.95	2.25	4.4	5.2	4.05	4.15	3.8	3.10	3.12	3.49	2.59	2.57
11	1.98	2.14	4.4	4.2	3.85	4.2	3.9	3.00	2.95	3.14	3.42	2.51
12	1.98	2.25	3.9	5.4	4.0	4.2	4.1	2.95	2.90	3.50	2.49	2.36
13	1.95	2.19	3.9	6.2	4.0	4.0	4.4	3.9	2.86	3.49	2.50	2.41
14	2.01	2.18	3.85	5.0	3.95	3.85	4.2	3.6	2.84	3.47	3.09	2.35
15	2.12	2.30	3.8	5.0	3.50	3.40	4.05	3.39	6.8	2.35	3.02	2.31
16	2.43	2.32	3.65	7.0	5.7	3.7	3.85	3.26	6.0	2.33	3.82	2.26
17	2.45	2.46	3.6	7.2	5.4	3.9	3.7	3.19	4.5	2.35	3.25	2.21
18	2.45	2.58	3.20	10.6	4.7	3.95	3.40	3.05	3.85	3.20	5.4	2.20
19	2.47	2.51	3.20	10.6	4.2	3.85	3.40	2.95	3.55	3.05	3.95	2.58
20	2.45	2.51	4.15	8.0	3.09	3.75	3.35	2.95	2.95	2.90	2.25	4.35
21	2.43	2.44	7.4	5.7	2.84	3.7	3.44	2.96	3.10	2.80	3.10	3.7
22	2.37	2.18	10.5	4.7	2.09	3.6	3.20	2.99	3.00	2.80	3.00	4.6
23	2.27	2.18	6.0	4.3	3.05	3.55	3.16	2.96	2.95	3.05	3.01	3.8
24	2.26	2.19	4.6	4.25	3.43	3.50	3.7	2.81	2.79	2.88	3.30	3.33
25	2.26	2.40	4.2	5.2	4.35	3.50	3.7	2.46	2.69	2.75	3.09	3.10

Daily gage height, in feet, of Tygart Valley River at Belington, W. Va., for the year ending Sept. 30, 1915 (Continued).

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
26	2.26	2.33	4.6	5.1	5.0	3.7	3.65	3.41	2.55	2.64	3.02	2.64
27	2.35	2.31	4.2	4.7	4.05	4.6	3.50	3.24	2.52	2.52	2.95	2.50
28	2.56	2.29	4.0	4.25	4.1	3.46	3.6	3.30	2.45	3.40	2.82	2.70
29	2.41	2.28	4.35	4.05	.....	3.42	6.0	3.31	2.39	2.40	2.64	2.70
30	2.51	2.25	6.9	4.35	.....	4.05	6.6	3.40	2.35	2.48	2.31	2.65
31	2.48	.....	7.5	4.6	.....	3.9	.....	3.30	.....	2.61	3.55	.....

NOTE.—River frozen over Nov. 24 and Dec. 15-19.

Pleasant Creek rises in Barbour, near the Taylor Line, flows eastward and crosses the Taylor Line, emptying into the Tygart Valley, one-half mile above Stonehouse, the elevation of its source being 1700 feet and of its mouth 995 feet, making a total fall of 705 feet. The area of its drainage basin is 11.22 square miles.

Sandy Creek rises at the common corner of Barbour, Preston, and Tucker, at an elevation of 3000 feet, flows northwestward, emptying into the Tygart Valley at the Barbour-Taylor Line, the elevation at that point being 1020 feet. Throughout most of its course, it is a rapid stream. The area of its drainage basin is 90.25 square miles.

Big Cove Run rises in northeastern Barbour at an elevation of 1800 feet, flows westward and empties into the Tygart Valley at Cove Run Station, its elevation at that point being 1050 feet, making a total fall of 750 feet. Throughout most of its course, it is a placid, base-leveled stream, but one mile above its mouth it changes to a raging torrent and so continues to the river. The area of its drainage basin is 4.2 square miles.

Teter Creek rises on a high shelf along the slope of the Laurel Ridge, 2½ miles south of Kirt, flows northward for about five miles, then veers to the northwest and empties into the Tygart Valley at Moatsville. The elevation of its source is about 2500 feet, and of its mouth 1130 feet, making a total fall of 1370 feet. The stream reaches a base-leveled condition where the Belington Syncline crosses it above Nestorville but through most of its course it is rough. The area of its drainage basin is 47.30 square miles.

Laurel Creek rises on the slope of the Laurel Ridge three miles northeast of Belington, at an elevation of about 2500 feet, flows northwestward through a tortuous channel and empties into the Tygart Valley one mile below Arden, at an elevation of 1210 feet, the total fall being 1290 feet. One mile north of Vannoys Mill, the creek forks, the more northern branch being called Glady Creek and the southern or main branch being known as Sugar Creek. These two creeks have nearly reached the base-leveled condition along the Belington Syncline, but farther north the main creek it still rough. The area of its drainage basin is 54 square miles.

Hackers Creek of Tygart Valley River rises in central Barbour about one mile and a half southwest of Berryburg, at an elevation of 1700 feet, flows eastward, and empties into the Tygart Valley at Berryburg Junction, the elevation at that point being 1300 feet, making a total fall of 400 feet. The area of its drainage basin, including Foxgrape Run, its principal tributary, is 10.55 square miles.

Beaver Creek rises against the slope of the Laurel Ridge about two miles east of Dartmoor, at an elevation of about 2700 feet, flows generally southwestward and empties into the Tygart Valley just above Gage, at an elevation of 1715 feet, making a total fall of 985 feet. Throughout the lower course, it is rough but between Weaver and Tigheview it is placid. The area of its drainage basin is 8.25 square miles. Beaver Creek is peculiar in that it flows toward the parent stream at an opposite angle from that which a tributary stream usually assumes, the explanation for this fact not being apparent.

Zebs Creek rises in Barbour 3 miles southwest of Belington, at an elevation of 2200 feet, flows southward and empties into the Tygart Valley at the Randolph Line, at an elevation of 1740 feet, the total fall being 460 feet. This creek, like Beaver on the east side, flows into the river at an unnatural angle, its course being almost opposite to that of the parent stream. The area of its drainage basin is 4.75 square miles.

Roaring Creek rises in Randolph 2 miles north of Cassity, at an elevation of about 2800 feet, flows principally northward and empties into the Tygart Valley at Roaring Creek Junction, at an elevation of 1840 feet, making a total fall of 960 feet. The area of its drainage basin is 29.75 square miles, Flatbush

Fork being the principal tributary, while the opposite or eastern fork heads against Rich Mountain. The creek derives its name from the fact that throughout several miles of its lower course it flows over the great conglomerate ledges of the upper Pottsville, making it extremely turbulent and rough.

Simpson Creek.

Simpson Creek rises in northern Barbour at Berryburg, at an elevation of 1600 feet, flows northwestward across Taylor County and empties into the West Fork River at Meadowbrook, Harrison County, the elevation at that point being 900 feet. Throughout its length it is a sluggish stream, being nearly base-leveled. The area of its drainage basin is 84.6 square miles, only a small portion of which is in Barbour.

Elk Creek.

Elk Creek rises in central Barbour near Tygart Junction, the elevation of its source being 1600 feet, flows northwestward and empties into the West Fork River at Clarksburg, Harrison County, the elevation at that point being 925 feet. The topographic map clearly shows that this creek has stolen from the Tygart Valley River the upper portion of its drainage basin above Overfield, its source now being within one mile of the main drainage channel of the river. The area of its drainage basin is 121.7 square miles. Its principal tributaries are Brushy Fork and Gnatty Creek.

Brushy Fork rises in northwestern Barbour, 1.5 miles northeast of Pepper, its elevation being 1700 feet, flows generally westward, and empties into Elk Creek one mile below Quiet Dell, Harrison County, the elevation at the mouth being 960 feet, making a total fall of 740 feet. Like nearly all the other West Fork tributaries, it is a sluggish stream. The area of its drainage basin is 21.1 square miles, only about half of which is in Barbour.

Gnatty Creek rises in Barbour, near the common corner of that county with Upshur and Harrison, its elevation there being 1600 feet, flows generally northwestward, and empties into Elk Creek one-half mile below Romines Mills, the elevation there being 995 feet, making a total fall of 605 feet. The area of its drainage basin is 33.90 square miles, a considerable portion of which is in Harrison. It is a quiet stream approaching base-level.

Rooting Creek rises in northwestern Upshur, 2.3 miles west of Ruraldale, at an elevation of 1525 feet, flows nearly due north and empties into Gnatty Creek one-half mile above Romines Mills, its elevation at that point being 1005 feet, making a total fall of 520 feet. It is a sluggish stream but has not yet reached base-level. The area of its drainage basin is 12.45 square miles, most of which is in Harrison County.

Middle Fork River.

The Middle Fork River rises in Randolph County 3 miles east of Hartridge, the elevation of its source on Rich Mountain being 3800 feet, flows northward and empties into the Tygart Valley at Middle Fork in Barbour, its elevation there being 1490 feet, making a total fall of 2310 feet. This great fall, together with the fact that throughout almost its entire length it flows through the Pottsville Series the boulders from which litter its channel, makes it one of the most rough and turbulent watercourses of the State. The area of its drainage basin is 151.2 square miles, a portion of which is in Upshur. Owing to the steep mountains on either side, the run-off is violent but is checked somewhat by the wooded condition of the watershed which insures a considerable flow during the dry summer months. The principal tributaries are Right Fork and Left Fork.

Right Fork rises in Randolph near High Germany Knob, at an elevation of 3400 feet, flows generally northward and meets Left Fork at the Upshur-Randolph Line, one-half mile south of Gale, the elevation at the junction being 1830 feet, making a total fall of 1570 feet. The area of its drainage basin is 31 square miles. The stream is rough and turbulent throughout its course.

Left Fork rises in Randolph on Rich Mountain at an elevation of 3800 feet, flows slightly west of north and meets Left

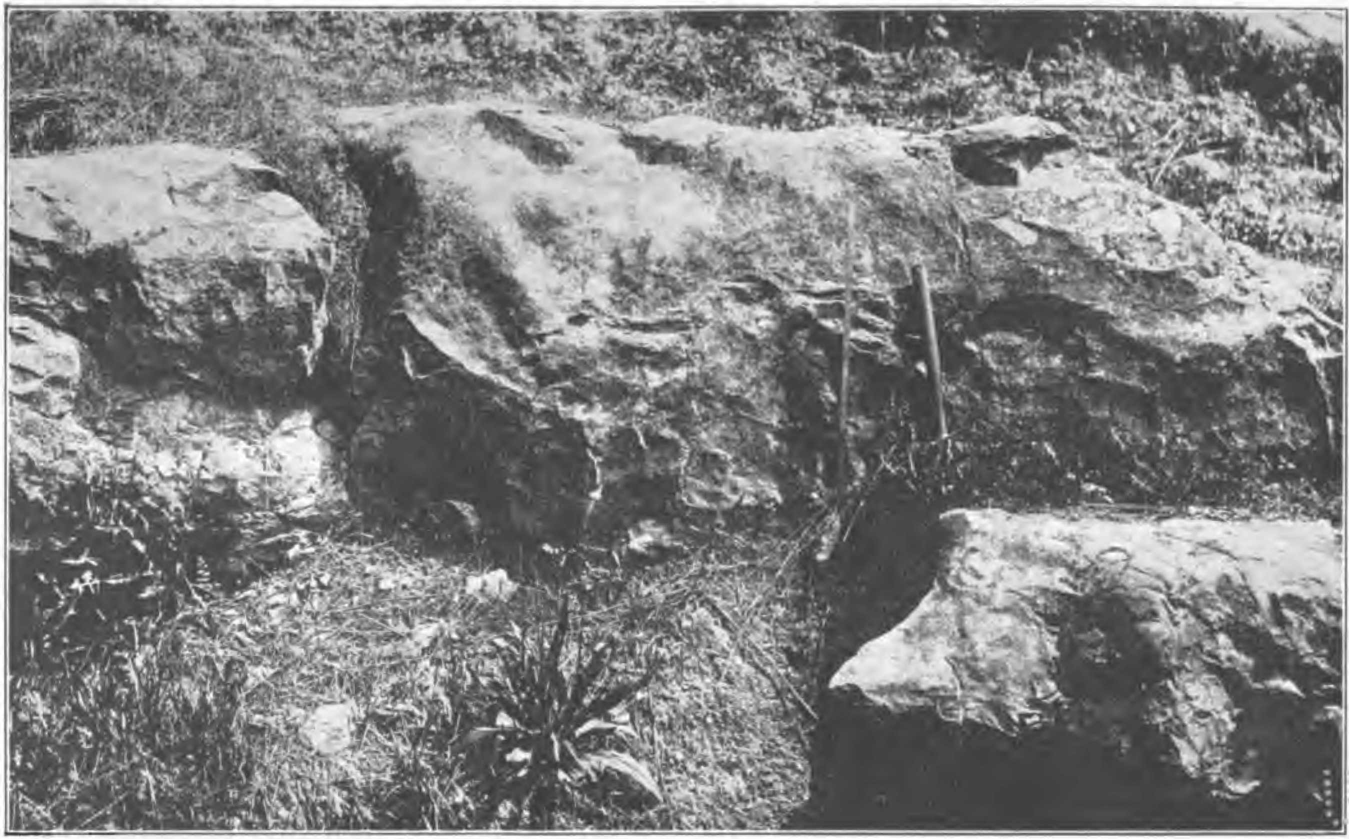

PLATE IV.—Redstone Limestone on Winford Knight Farm, one mile east of Pepper, Barbour County; two-foot rule indicates approximate thickness.

Fork at the point above mentioned near Gale, its total fall being 1970 feet. The area of its drainage basin is 78.75 square miles, and like the Left Fork it is rough and rapid in the extreme. Its principal tributaries are Long Run and Cassity Fork.

Long Run rises in Randolph near See Camp Gap, at an elevation of 3250 feet, flows due north and empties into Left Fork of Middle Fork four miles northwest of Cassity, its elevation there being 1875 feet. Its course throughout is nearly straight, and the area of its drainage basin is 9.3 square miles.

Cassity Fork rises against Rich Mountain at an elevation of 3500 feet, flows westward and empties into Left Fork of Middle Fork at Cassity, its elevation there being 2005 feet, making a total fall of 1495 feet. Its course is entirely through a wooded region, extremely rough and inaccessible. The distance from head to mouth is only a few miles but there are several large branches of almost equal size, making the run-off large at the mouth of the stream. The area of its drainage basin is 16.2 square miles.

Buckhannon River.

The Buckhannon River rises at the Parting Springs, 4.5 miles southeast of Pickens, Randolph County, at an elevation of 3750 feet, flows northward through Upshur to Buckhannon, where it veers to the northeast and empties into the Tygart Valley at Tygart Junction, in Barbour, the elevation at that point being 1310 feet, making a fall of 2440 feet. From its source to Hampton, the course of the stream is rough and turbulent, being mostly in the Pottsville, but from Hampton to Century Junction, it is a smooth placid stream, approaching the base-level condition. From Century Junction to its mouth, it again becomes rough and rapid, having a considerable fall. The run-off in the spring months is usually violent often causing great floods. The total area of its drainage basin is 310.15 square miles. The principal tributaries are Big Run, Pecks Run, Sand Run, Turkey Run, Fink Run, French Creek, Panther Fork, Left Fork, and Right Fork.

Big Run rises in Barbour near Century, at an elevation of 1700 feet, flows southeastward, and empties into the Buckhannon at Century Junction, the elevation of that point being 1350 feet, making a total fall of 350 feet. It is a sluggish quiet stream, having nearly reached base-level. The area of its drainage basin is 6.6 square miles.

Pecks Run rises in Upshur near its common corner with Harrison and Barbour, at an elevation of 1700 feet, flows southeastward and empties into the Buckhannon at Hall Station, in Barbour, the elevation at that point being 1375 feet, making a total fall of 325 feet. Its course through Upshur is placid, closely approaching base-level, but in Barbour it is swift and turbulent. The total area of its drainage basin is 13.6 square miles.

Sand Run rises in Upshur, 1.5 miles southwest of Kedron, at an elevation of 2100 feet, flows northward and empties into the Buckhannon one-fourth mile above Wentz Ford, the elevation there being 1385 feet, making a total fall of 715 feet. Throughout most of its course, it is a rough swift stream, the area of its drainage basin being 29.4 square miles.

Turkey Run rises in Upshur near Bear Knob, at an elevation of 1700 feet, flows southeastward and empties into the Buckhannon 2 miles northeast of Buckhannon, the elevation there being 1390 feet, making a total fall of 310 feet. Its course is very quiet, having many meanders that indicate its near approach to base-level. The area of its drainage basin is 8.75 square miles.

Fink Run rises in the edge of Lewis, 2 miles northwest of Lorentz, at an elevation of 1700 feet, flows southeastward through Upshur and empties into the Buckhannon River at Buckhannon, where its elevation is 1390 feet, making a total fall of 310 feet. This stream, like Big Run, Pecks Run, and Turkey Run, has cut practically a base-level channel nearly to its source so that the general condition is that of a placid stream. The area of its drainage basin is 16.65 square miles.

Little Sand Run rises at Ivy, in Upshur, at an elevation of 1700 feet, flows northwestward and empties into the Buckhannon River at the southern limits of South Buckhannon, the elevation there being 1395 feet, making a total fall of 305 feet. The area of its drainage basin is 5.7 square miles.

French Creek rises at the Upshur-Lewis Line 1.3 miles west of Frenchton, at an elevation of 1700 feet, and flows northeastward through Upshur to Hampton, where it empties into the Buckhannon, the elevation at that point being 1405 feet, making a total fall of 295 feet. The course of the stream is very crooked, indicating a previous base-leveled condition as the meanders are through a narrow valley and the current is comparatively swift. The area of its drainage basin is 49.50 square miles. About half of its previous drainage area has been lost to the West Fork and Little Kanawha Rivers. Its principal tributary is Laurel Fork which flows in from the south emptying 1.7 miles east of French Creek town.

Tenmile Creek rises in Upshur, one-half mile west of Queen, at an elevation of 2250 feet, flows westward and empties into the Buckhannon at Tenmile, the elevation there being 1600 feet, making a total fall of 650 feet. It is a rough stream, not far advanced in the present cycle of erosion. The area of its drainage basin is 8.5 square miles.

Panther Fork rises in Upshur, three-fourths mile southwest of Hemlock, at an elevation of 2750 feet, flows northwestward and empties into the Buckhannon at Beans Mill, the elevation there being 1745 feet, making a total fall of 1005 feet. The area of its drainage basin is 6.25 square miles, most of its course being through a rough wooded region.

Left Fork of Buckhannon River rises, as previously described under the parent stream, at the Parting Springs in Randolph, flows northward to the Upshur Line where it turns to the northwest, meeting the Right Fork at Alexander, the elevation there being 1840 feet, making a total fall of 1910 feet. Its course is through a rough, wooden region, and the stream is turbulent. The area of its drainage basin is 37.4 square miles.

Right Fork of Buckhannon River rises in Randolph, 2.3 miles south of Pickens, at an elevation of 3200 feet, flows northward to Alexander where it unites with the Left Fork, the elevation at that point being 1840 feet, making a total fall of 1360 feet. It is a rough and rapid stream except between

Pickens and Silica where it has a more placid course. The area of its drainage basin is 53 square miles. At Newlon the tributaries called the Middle Fork and Left Fork branch from it, the latter being much the larger stream. This latter branch rises 1.7 miles southeast of Pickens and flows generally northward by a crooked channel until it unites with the main Right Fork at Newlon, the area of its drainage basin being 18.15 square miles.

Hackers Creek of West Fork River.

Hackers Creek rises in Upshur, 1.2 miles southwest of Pecks Run, at an elevation of about 1750 feet, flows northwestward across Upshur and through Lewis and empties into the West Fork River in Harrison County, 2 miles north of Lightburn, the elevation at its mouth being 980 feet, making a total fall of 770 feet. Its course from the head to Berlin is nearly straight but from Berlin to its mouth the valley is wide and the creek has a meandering channel, showing that it has nearly reached base-level. The area of its drainage basin is 54.4 square miles, the principal tributaries being Jesse Run, Lifes Run, and Laurel Lick.

Jesse Run rises in the northwest corner of Upshur, at an elevation of 1700 feet, flows westward and empties into Hackers Creek one mile east of Jane Lew, the elevation at that point being 1015 feet, making a total fall of 685 feet. It is a quiet stream, being practically base-leveled nearly to its head. The area of its drainage basin is 10.74 square miles.

Right Fork of Stonecoal Creek.

Right Fork of Stonecoal Creek rises in Upshur, 1.5 miles northeast of Abbott, at an elevation of about 1600 feet, flows generally northwestward into Lewis and empties into main Stonecoal Creek at Horner, where the elevation is 1020 feet. The area of its drainage basin is 20.5 square miles, all that part of it in Upshur having been stolen from Brushy Fork of Fink Run.

Little Kanawha River.

The Little Kanawha River, which is one of the most extensive drainage channels in the State, rises in Upshur near Craddock, where its elevation is 2765 feet, flows northwestward across Upshur and other counties and finally empties into the Ohio River at Parkersburg, where the elevation is 564 feet, making a total fall of 2201 feet. That portion of the stream in Upshur is rapid and turbulent, being actively engaged in a great assault on the Buckhannon River watershed, and having cut its way to within less than one-half mile of the Right Fork of the latter stream at Craddock. The entire area of its drainage basin is approximately 2150 square miles and its length 145 miles. Its principal tributary affecting Upshur County is the Right Fork.

Right Fork of Little Kanawha River rises at the common corner of Upshur, Lewis, and Webster, at an elevation of 2765 feet, flows northwestward 12 miles to the Little Kanawha at Wildcat, where its elevation is 940 feet, making a total fall of 1825 feet. The area of its drainage basin is 37.5 square miles. Most of the territory through which it flows is wooded, and the flow is more constant than along the lower portion of the main river. For most of its length, it is a rapid, shallow stream.

Elk River.

Elk River rises in Pocahontas County, near Spruce Knob, at an approximate elevation of 4000 feet, flows northward into Randolph, veers northwestward across Webster and Braxton, and at Sutton changes its course to the southwest and continues to Charleston, Kanawha County, where it empties into the Great Kanawha River, its total length being 172 miles. At the Whitaker Falls where it crosses the Randolph-Webster Line, the elevation is 2150 feet, making a fall of 1850 feet from its source. The area of its drainage basin above Mill Run is 106 square miles. Through Randolph County it is a rough shallow stream. Its principal tributary affecting Randolph is the Back Fork.

Back Fork of Elk River rises in Randolph near the Whitman Knob, at an elevation of about 3700 feet, flows southwestward into Webster and empties into main Elk at Webster Springs. Its elevation at the Randolph-Webster Line is 2525 feet, making a fall of 1175 feet from its source. The total area of its drainage basin is 70 square miles, and its principal tributary is Sugar Creek.

Sugar Creek rises against Turkeybone Mountain, 4 miles southeast of Pickens, at an elevation of 3600 feet, flows southwestward through Randolph into Webster and empties into the Back Fork of Elk at Skelt, where its elevation is 1900 feet. The area of its drainage basin is 24.15 square miles, and its principal tributary is Little Sugar Creek.

TOPOGRAPHIC FEATURES.

Western Barbour and northern Upshur differ in no essential feature in their topographic forms from the other central and western counties. There is a general succession of narrow ridges broken by the intervening valleys, some of which have been worn to a considerable width by the gradual stream work. The ridges vary from 200 to 500 feet high, the ancient peneplain being represented by occasional high tops reaching 100 feet or more above the general summits. The most pronounced feature of this region is the general difference of level existing between the drainage of the Tygart Valley and Buckhannon Rivers on the east, and that of the West Fork and Little Kanawha on the west; varying from 300 to 400 feet, the streams on the west occupying the lower level. This difference of level between these watersheds is due to the fact that the western streams have cut their channels much deeper than the eastern ones, the general summit of the hills being much the same.

East of the Tygart Valley River, in Barbour, a more diverse topography appears, the influence of geologic structure being pronounced. East of Philippi, along the Hiram Anticline, a high range of hills appears, 100 feet or more higher than those immediately west of Philippi, while farther east along the Belington Syncline, the hills are low and rounded, and along the extreme eastern border of the county the great

Laurel Ridge caused by a great uplift towers far above the low synclinal hills, at times being more than 1000 feet above them.

This same condition continues southward into Randolph County, where the same great range, under the title of Rich Mountain, changed in name but not in any essential physical feature, extends for many miles south of the Tygart Valley River which makes a gap between it and the Laurel Ridge. The effect of the Belington Syncline is visible as far south as West Huttonsville along the Middle Fork River, the hills being lower along its axis than the great ridge along the anticline to the west.

In southern Upshur the geologic structure is that of a monocline rising steadily toward the mountains to the southeast and this fact is reflected in the topography, the hilltops becoming gradually higher above sea-level.

In the region south of Pickens in Randolph County, there is less structural relief between the Hiram Anticline and the Belington Syncline and the topography undergoes a corresponding change. Point Mountain branches off from Rich Mountain and extends westward with an uninterrupted skyline, dipping gradually toward the region of lower structural relief.

PART II.

Stratigraphy.

CHAPTER III.

STRUCTURE

Description of Terms.

Geologic structure, treating of the pitch of the stratified rocks, has been amply discussed in previous Reports of the Survey. Since these Reports are available, this discussion will not be repeated here, but the following paragraph, taken from a former County Report[1], gives a definite idea of simple scientific terms that will benefit the general reader:

> "In the discussion of these structural forms on subsequent pages, the upward bending arch is known as an **anticline**; the downward bending trough, a **syncline**; the line joining the highest points of an anticline or the lowest points of a syncline, the **axis** of the fold; the direction of the horizontal edges of dipping strata, the **strike**; and the structural form resulting from the sudden rise or fall of the axis of an anticline, the **nose** of the fold."

Method of Representing Structure.

The contour method of representing structure has been used in this Report. By this method of representation, a single coal bed or other prominent and easily recognized geological horizon is used as a "key-rock", its elevation above sea-level being determined either by observation made directly upon it or by its interval being computed from other known horizons above or below it in the rock column. In this area it was not considered wise to base the structure of the whole territory on one single coal as there is such a large rise in the measures from the northwest to the southeast that any coal being at the surface in northern Upshur and western Barbour would be far above the mountains of western Randolph, and its interval down to the surface rocks only a matter of conjecture; and conversely, any coal cropping at the surface in the southern end of the territory would, in the northwestern part, be far underground and therefore uncertain as a "key-rock" because there are not enough borings to determine its position accurately at all points needed. Consequently, it has seemed best to use a separate "key-rock" for the northwestern part and another for the southeastern area. In northern Upshur and western Barbour, the two principal surface coals are the Redstone and Pittsburgh, being about equally persistent and differing but little in their value for stratigraphy, but the **Pittsburgh Coal** has been used in previous County Reports on Harrison, Lewis, and Taylor, adjoining the counties now under discussion, and it will for that reason be used in this Report as the structural "key-rock" of the northwestern region, its elevation above sea-level at all points being shown by means of **green contour lines** on Maps II and IV, which accompany this Report in a separate atlas. These contours represent the base of the coal, which coincides also with the base of the Monongahela Series. Each contour is marked with figures showing the elevation that it represents, the interval between them being 25 feet.

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[1] Ray V. Hennen, Monongalia-Marion-Taylor Report, W. Va. Geol. Survey, p. 76; 1913.

In the southern part of Upshur, and in eastern Barbour and western Randolph, the **Lower Kittanning Coal,** near the base of the Allegheny Series, is the most important coal, having been mined extensively, and is the most persistent horizon that is easily recognized, and will therefore be used as the "key-rock" for this region. Its elevation above sea-level is shown on Maps II and IV by **red contour lines,** with a 25-foot interval between them. It is true that in portions of Middle Fork and in Mingo and Huttonsville Districts in Randolph, this coal horizon belongs entirely above the mountain tops, but its interval to the surface coals has been fairly well determined at its last outcrop and for the sake of simplicity, its horizon has been mapped on all this southern area, as the difficulty of introducing a third "key-rock" would be considerable. The contour interval on that portion covered by the Lower Kittanning Coal is 25 feet, except along the slope of the Laurel Ridge and Rich Mountain where the strata rise so rapidly that only the hundred-foot lines are shown. The numbers are placed on them so frequently that no difficulty need be experienced about the contour interval at any point.

Reference to Maps II and IV will show that the green contours on the Pittsburgh Coal end with the 2000-foot level. This horizon was selected for the double reason that the Pittsburgh Coal passes above the hilltops along that line, and also, fortunately, the Lower Kittanning lies below the Pittsburgh at an interval of about 775 feet all along it. The Lower Kittanning horizon would therefore be found at 1225 feet above sea-level along this horizon and hence in changing to the new datum, it was only necessary to draw the 1250-foot red contour along the next 25 feet of southeastern rise in the rocks.

Each contour is a line of strike showing that the coal it represents is at the same elevation above sea-level at all points along it. The contour interval being 25 feet, with the exceptions noted for Laurel Ridge and Rich Mountain, it is possible to know, with considerable accuracy, not only the position of the coal itself but also the approximate position of any other formation above or below it in the rock column, by merely adding or subtracting its known interval to or from that of the "key-rock" depending on whether the formation desired is above or below the contoured coal. In making the maps care was used to determine, as far as possible, the position of the "key-rock" itself, readings being taken upon it either by aneroid checked frequently during the day upon spirit-level determinations on the topographical maps, or by measuring up to it with the hand-level when this method was possible. Where the contoured coal was above the hilltops or below drainage, it was necessary to use other formations as temporary "key-rocks", the intervals of which from the coal had been carefully determined at numerous points.

About 225 borings, either for oil or coal, have been made within the area and the records of a large number of these have been secured from the operators, and proved of great benefit in making the structure maps. There is no large variation in the thickness and intervals of the various rock formations above the Lower Kittanning Coal, but below this coal there is a very great variation caused by the southward expansion of the Pottsville Series. In order to secure the best possible results, numerous careful geologic sections were made at frequent points, usually with hand-level directly on the strike of the rocks. From these sections the two following tables were compiled, the first showing the approximate intervals of the coals and other important formations above and below the Pittsburgh Coal at numerous points, and the second table showing the same information for the Lower Kittanning. In the first table, no intervals are shown below the Kittanning and on the second none is shown above the Pittsburgh Coal. The intervals in both tables between the Pittsburgh and Kittanning are identical but convenience makes repetition desirable in both tables.

The detailed sections from which the following tables were made, as well as many other sections, are published in Chapter IV and should be carefully studied by those who desire to make local studies of any coal or other formation, since they contain much detailed information that can not be shown in the tables of intervals or on Maps II and IV. In order to find the approximate elevation of any coal, its interval from the Pittsburgh or Lower Kittanning, as the case may be, should first be obtained from one of the following tables or from the local section for the nearest point. With the structure contours as a guide, the coal should then be easily found:

Intervals above and below Pittsburgh Coal.

Formations.	Barbour County.									Upshur County.									
	Astor.	Belington.	Century.	Colebank.	Elk City.	Meadowville.	Moatsville.	Overfield.	Philippi.	Alexander.	Arlington.	Bear Knob.	Buckhannon.	Cleveland.	Craddock.	French Creek.	Hinkle.	Queen.	Sago.
Waynesburg Coal	400	......	400	......	......	......	......	400	......	......	......	355	......	......	......	......	......	......	......
Uniontown Coal	300	......	300	......	......	......	......	275	......	......	......	275	......	......	......	......	......	......	......
Sewickley Coal	125	......	160	......	......	......	......	110	......	......	......	80	......	......	......	......	......	......	......
Redstone Coal	40	......	40	......	......	......	......	40	......	......	......	40	......	......	......	......	......	......	......
PITTSBURGH COAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Pittsburgh Coal	50	50	60	75	55	......	......	50	......	......	......	45	50	......	......	......	......	......	......
Little Clarksburg Coal	135	110	150	150	125	135	......	135	......	......	......	85	130	......	......	......	......	......	......
Normantown Coal	215	200	210	230	230	225	......	215	......	......	......	135	165	......	......	......	......	......	......
Elk Lick Coal	250	240	240	290	265	295	......	250	......	......	......	200	265	......	......	250	......	......	......
West Milford Coal	280	275	270	320	......	......	......	......	......	......	......	......	295	......	......	......	......	......	......
Harlem Coal	310	315	300	350	......	365	315	......	......	......	......	270	325	......	......	310	......	......	......
Bakerstown Coal	425	415	400	440	......	445	410	......	425	......	......	370	425	......	......	400	440	......	......
Brush Creek Coal	525	505	500	520	......	535	490	......	515	......	500	470	515	460	......	485	520	......	......
Upper Freeport Coal	630	600	585	610	......	635	570	......	625	......	570	570	575	550	......	550	610	......	580
Lower Freeport Coal	......	650	......	660	......	685	635	......	675	......	610	630	615	590	......	610	640	......	......
Upper Kittanning Coal	......	730	......	700	......	765	705	......	725	......	675	700	725	630	......	675	680	......	690
Middle Kittanning Coal	......	770	......	......	......	775	......	......	......	775	750	775	750	705	730	760	725	755	765
Lower Kittanning Coal	750	795	800	780	......	815	765	......	755	785	780	800	775	760	785	775	750	775	775

Intervals above and below Lower Kittanning Coal.

Formations.	Barbour County.									Upshur County.											Randolph County.					
	Astor.	Belington.	Century.	Colebank.	Elk City.	Meadowville.	Moatsville.	Overfield.	Philippi.	Alexander.	Arlington.	Bear Knob.	Buckhannon.	Cleveland.	Craddock.	French Creek.	Hinkle.	Palace Valley.	Queen.	Sago.	Adolph.	Cassity.	Hartridge.	Midvale.	Pickens.	Roaring Creek Jct.
Pittsburgh Coal	750	795	800	780	775			775				800	775													
Little Pittsburgh Coal	700	745	760	705	720			725				755	725													
Little Clarksburg Coal	615	685	650	630	650	680		640				715	645													
Normantown Coal	535	595	590	550	545	590		620				665	610													
Elk Lick Coal	500	555	560	490	510	520		525				605	510													
West Milford Coal		520	530	460									470													
Harlem Coal		480	500	430		450	450					530	450													
Bakerstown Coal		380	400	340		370	355		320			430	350				310									
Brush Creek Coal		290	300	260		280	275		230		280	330	260	300		310	230									
Upper Freeport Coal		195	215	170		180	195		130		210	230	200	210		235	140			190						
Lower Freeport Coal				120		130	180		80		170		160	170												
Upper Kittanning Coal		65		80		50	60		20		105		50	130		100	70			85						
Middle Kittanning Coal		25				40				10	30		25	55		15			20							40
LOWER KITTANNING COAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clarion Coal				45							15															40
Homewood Sandstone, top		10		45			20		20	15	15		25	10	5	10			10	15					10	40
Upper Mercer Coal		85		105			75		70	105	60	45	100	90	65				55	70					60	
Lower Mercer Coal											105	80		140	140	150			115						110	
Quakertown Coal		185								170				200	200			200			200	200			165	220
Chilton Coal																									300	
Cedar Grove																									340	
Alma Coal																		310			380	300			400	
Campbell Creek (No. 2 Gas)														275	395			340	285		410	345	420	300	480	310
Powellton Coal														310				380	330		460	385		340		355
Eagle Coal															590			470	355		490	445	580	410	600	390
Gilbert Coal																		520			620	545	645	470		430
Hughes Ferry Coal															655			605			675	590	715			450
Lower Iaeger Coal																		635			705	620	750			
Castle Coal															700			695			765	625	800			470
Sewell "B" Coal															840			745			880	690	860	595		
Sewell Coal														745	870			775	730	785	885	750	900	610		520

Intervals above and below Pittsburgh Coal.

Formations.	Barbour County.									Upshur County.									
	Astor.	Belington.	Century.	Colebank.	Elk City.	Meadowville.	Moatsville.	Overfield.	Philippi.	Alexander.	Arlington.	Bear Knob.	Buckhannon.	Cleveland.	Craddock.	French Creek.	Hinkle.	Queen.	Sago.
Waynesburg Coal	400	......	400	......	......	......	......	400	......	......	......	355	......	......	......	......	......	......	......
Uniontown Coal	300	......	300	......	......	......	......	275	......	......	......	275	......	......	......	......	......	......	......
Sewickley Coal	125	......	160	......	......	......	......	110	......	......	......	80	......	......	......	......	......	......	......
Redstone Coal	40	......	40	......	......	......	......	40	......	......	......	40	......	......	......	......	......	......	......
PITTSBURGH COAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Pittsburgh Coal	50	50	60	75	55	......	......	50	......	......	......	45	50	......	......	......	......	......	......
Little Clarksburg Coal	135	110	150	150	125	135	......	135	......	......	......	85	130	......	......	......	......	......	......
Normantown Coal	215	200	210	230	230	225	......	215	......	......	......	135	165	......	......	......	......	......	......
Elk Lick Coal	250	240	240	290	265	295	......	250	......	......	......	200	265	......	......	250	......	......	......
West Milford Coal	280	275	270	320	......	......	......	......	......	......	......	......	295	......	......	......	......	......	......
Harlem Coal	310	315	300	350	......	365	315	......	......	......	......	270	325	......	......	310	......	......	......
Bakerstown Coal	425	415	400	440	......	445	410	......	425	......	......	370	425	......	......	400	440	......	......
Brush Creek Coal	525	505	500	520	......	535	490	......	515	......	500	470	515	460	......	485	520	......	......
Upper Freeport Coal	630	600	585	610	......	635	570	......	625	......	570	570	575	550	......	550	610	......	580
Lower Freeport Coal	......	650	......	660	......	685	635	......	675	......	610	630	615	590	......	610	640	......	......
Upper Kittanning Coal	......	730	......	700	......	765	705	......	725	......	675	700	725	630	......	675	680	......	690
Middle Kittanning Coal	......	770	......	......	......	775	......	......	......	775	750	775	750	705	730	760	725	755	765
Lower Kittanning Coal	750	795	800	780	......	815	765	......	755	785	780	800	775	760	785	775	750	775	775

Intervals above and below Lower Kittanning Coal.

Formations.	Barbour County.									Upshur County.											Randolph County.					
	Astor.	Belington.	Century.	Colebank.	Elk City.	Meadowville.	Moatsville.	Overfield.	Philippi.	Alexander.	Arlington.	Bear Knob.	Buckhannon.	Cleveland.	Craddock.	French Creek.	Hinkle.	Palace Valley.	Queen.	Sago.	Adolph.	Cassity.	Hartridge.	Midvale.	Pickens.	Roaring Creek Jct.
Pittsburgh Coal	750	795	800	780	775	....	....	775	....	....	....	800	775	....	....	....	....	....	....	....	....	....	....	....	....	....
Little Pittsburgh Coal	700	745	760	705	720	....	....	725	....	....	....	755	725	....	....	....	....	....	....	....	....	....	....	....	....	....
Little Clarksburg Coal	615	685	650	630	650	680	....	640	....	....	....	715	645	....	....	....	....	....	....	....	....	....	....	....	....	....
Normantown Coal	535	595	590	550	545	590	....	620	....	....	....	665	610	....	....	....	....	....	....	....	....	....	....	....	....	....
Elk Lick Coal	500	555	560	490	510	520	....	525	....	....	....	605	510	....	....	....	....	....	....	....	....	....	....	....	....	....
West Milford Coal	....	520	530	460	....	....	....	....	....	....	....	....	470	....	....	....	....	....	....	....	....	....	....	....	....	....
Harlem Coal	....	480	500	430	....	450	450	....	....	....	....	530	450	....	....	....	....	....	....	....	....	....	....	....	....	....
Bakerstown Coal	....	380	400	340	....	370	355	....	320	....	....	430	350	....	....	....	310	....	....	....	....	....	....	....	....	....
Brush Creek Coal	....	290	300	260	....	280	275	....	230	....	280	330	260	300	....	310	230	....	....	....	....	....	....	....	....	....
Upper Freeport Coal	....	195	215	170	....	180	195	....	130	....	210	230	200	210	....	235	140	....	....	190	....	....	....	....	....	....
Lower Freeport Coal	....	....	....	120	....	130	130	....	80	....	170	....	160	170	....	....	....	....	....	....	....	....	....	....	....	....
Upper Kittanning Coal	....	65	....	80	....	50	60	....	20	....	105	....	50	130	....	100	70	....	....	85	....	....	....	....	....	....
Middle Kittanning Coal	....	25	....	....	....	40	....	....	....	10	30	....	25	55	....	15	....	....	20	....	....	....	....	....	....	40
LOWER KITTANNING COAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clarion Coal	....	....	....	45	....	....	....	....	....	....	15	....	....	....	....	....	....	....	....	....	....	....	....	....	....	40
Homewood Sandstone, top	....	10	....	45	....	....	20	....	20	15	15	....	25	10	5	10	....	....	10	15	....	....	....	....	10	40
Upper Mercer Coal	....	85	....	105	....	....	75	....	70	105	60	45	100	90	65	....	....	....	55	70	....	....	....	....	60	....
Lower Mercer Coal	....	....	....	....	....	....	....	....	....	....	105	80	....	140	140	150	....	....	115	....	....	....	....	....	110	....
Quakertown Coal	....	185	....	....	....	....	....	....	....	170	....	....	....	200	200	....	....	200	....	....	200	200	....	....	165	220
Chilton Coal	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	300	....
Cedar Grove	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	340	....
Alma Coal	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	310	....	....	380	300	....	....	400	....
Campbell Creek (No. 2 Gas)	....	....	....	....	....	....	....	....	....	....	....	....	....	275	395	....	....	340	285	....	410	345	420	300	430	310
Powellton Coal	....	....	....	....	....	....	....	....	....	....	....	....	....	310	....	....	....	380	330	....	460	385	....	340	....	355
Eagle Coal	....	....	....	....	....	....	....	....	....	....	....	....	....	....	590	....	....	470	355	....	490	445	580	410	600	390
Gilbert Coal	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	520	....	....	620	545	645	470	....	430
Hughes Ferry Coal	....	....	....	....	....	....	....	....	....	....	....	....	....	....	655	....	....	605	....	....	675	590	715	....	....	450
Lower Iaeger Coal	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	635	....	....	705	620	750	....	....	....
Castle Coal	....	....	....	....	....	....	....	....	....	....	....	....	....	....	700	....	....	695	....	....	765	625	800	....	....	470
Sewell "B" Coal	....	....	....	....	....	....	....	....	....	....	....	....	....	....	840	....	....	745	....	....	880	690	860	595	....	....
Sewell Coal	....	....	....	....	....	....	....	....	....	....	....	....	....	745	870	....	....	775	730	785	885	750	900	610	....	520

DETAILED STRUCTURE.

General Features.

As shown by Map II, the structure of western Barbour has been only slightly disturbed by upward or lateral movements, the dip of the rocks being gentle and usually perceptible only by careful levels. In the central part the disturbance is more marked and along the eastern boundary the great arches, in western Randolph, have lifted the rocks to such a height that the base of the Pottsville Series is near the top of Laurel Ridge. Taken as a whole, the structure sheet of the county shows a rise from the west toward the east, being at first gradual and finally abrupt, and interrupted by a few synclinal basins.

In Upshur, as shown by Map IV, the prevailing structural condition is a long gentle monocline, giving the rocks a gradual rise southeastward toward the mountains of Randolph, interrupted by only two shallow synclines that enter the northwestern corner of the county. Upshur is too far west to be affected by the great folds just east of Laurel Ridge.

In western Randolph the structure is a southward continuation of the features of eastern Barbour, there being a gradual rise to the south along the axes of the structural folds and on the east a sharp uplift along Rich Mountain, which is a continuation of Laurel Ridge southwestward.

The lowest structural point shown on the maps is in northwestern Upshur where the Pittsburgh Coal is somewhat less than 1200 feet above sea-level along the Grassland Syncline, being about the same as at the point where the Ligonier Syncline crosses northern Barbour. The highest structural elevation noted is along Point Mountain in Randolph, where, as indicated by the contours, the level of the Lower Kittanning Coal is 4500 feet above sea-level, being too high to be caught in the tops of the high mountains.

The structure map, on the whole, harmonizes closely with those previously issued by the Survey for contiguous areas. Along the line with Lewis, Harrison, and Taylor, the contours are on the Pittsburgh Coal, the same as that used in these three counties, and at most places the lines join exactly, differing by a contour interval at only one or two points. Along the Preston Line, the contours do not fit as the Upper Freeport Coal was used for the "key-rock" in Preston while the Lower Kittanning was used in eastern Barbour, but if the Barbour map were reduced to the same "key-rock" as Preston, the lines would join showing that there is no discrepancy in the structural interpretation in the two counties.

All of southern Upshur and a considerable portion of western Randolph were previously contoured by Taff and Brooks[2], the Lower Kittanning Coal having evidently been the "key-rock" although it is not given a definite name in the Buckhannon Folio of the United States Geological Survey where this work appears. The contours in that publication harmonize fairly well with those shown on Maps II and IV of the present Report, giving mute evidence of the care with which these earlier geologists worked, hindered as they were by wooded conditions, fewer coal openings and much less detailed topographic maps than those now available.

Anticlines.

Three anticlines, the Ruraldale, Hiram, and Marquess, appear on the structure map.

Ruraldale Anticline.—The Ruraldale Anticline of Hennen[3] has been previously noted in the southeastern corner of Harrison County, where the two ends of the fold cross into that territory. As now fully determined, this anticline originates in Harrison, 2 miles southeast of Oral, extends southeastward and crosses into Barbour 2 miles east of Grassland, keeps its southeastward course to the Brushy Fork of Elk, where it turns west of south, crosses Elk Creek, ½ mile east of Overfield, crosses into Harrison at Gnatty Creek, 1 mile west of Peeltree, continues for two miles across the extreme southeastern corner of this county, when it reaches the Upshur

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[2] Joseph A. Taff and Alfred H. Brooks, Buckhannon Folio No. 34, U. S. Geological Survey; 1896.

[3] Ray V. Hennen, Doddridge-Harrison Report, W. Va. Geol. Survey, p. 60; 1912.

Line and veers to the south, crossing Hackers Creek one-third mile west of Ruraldale and dying out soon afterward against the great monoclinal slope previously mentioned in Upshur. It is a shallow fold with a crooked, sinuous course, and is symmetrical about its axis, the rise on both sides being practically the same.

The surface geology along the axis is principally that of the Monongahela and Conemaugh Series, only a few of the highest hills being topped by the Dunkard. At the most northern point where it enters Barbour, the Pittsburgh Coal has an elevation of 1350 feet, but on Gnatty Creek where the fold again crosses the Harrison Line, the coal has dipped to the 1275-foot level, rising soon afterward to 1325 feet at the Upshur Line, and keeping the same elevation to the end of the arch.

Hiram Anticline.—The Hiram Anticline of Hennen[4], the most prominent structural feature of this Report, originates in Preston near Independence, assumes a course slightly west of south, crosses the southeastern corner of Taylor and enters Barbour one-half mile east of Hiram. Here it turns slightly more toward the west, crosses the Tygart Valley River 0.8 mile northwest of Cove Run Station, continues on the west side of this river for 3½ miles, crosses again to the east side 1.3 miles east of Arden, turns more to the south soon afterward, passes 2.3 miles east of Philippi, and 1.2 miles west of Calhoun, crosses the Tygart Valley River again one-fourth mile west of Clements, keeps the same course for 4 miles until it almost reaches the Middle Fork River, turns due south near the Finegan Ford, crosses from Barbour into Randolph, 2 miles east of Lantz, crosses the Coal and Coke Railway one-fourth mile west of Kingsville, assumes a course slightly east of south until it reaches a point one-half mile west of Pumpkintown where it turns slightly toward the west, crossing the Middle Fork River 1.5 miles northwest of Cassity. From the Middle Fork, its course remains much the same, passing through Loda, See Camp Gap, and Hartridge, where it turns toward the southeast and continues to Point Mountain two miles west of Monterville, beyond which it has not been studied. For the most part, the fold is symmetrical about its axis, the dip being much the same on either side. Aside from the slight local deflections mentioned above, its course is remarkably straight, being about 15 degrees west of south.

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[4] Ray V. Hennen, Monongalia-Marion-Taylor Report, W. Va. Geol. Survey. p. 84; 1913.

The surface geology along the axis is principally that of the Conemaugh, Allegheny, and Pottsville Series, the top of the Mauch Chunk being exposed only along the deep gorges of Middle Fork, Buckhannon, and Elk Rivers. In northern Barbour, the Lower Kittanning Coal is 1250 feet above sea-level at Sandy Creek where there is a slight dome, dips to a gentle saddle just north of Cove Run, rises to another dome southwest of Cove Run, having an elevation of 1350 feet, and descends again to a slight saddle northeast of Arden, the elevation being only 1325 feet. From this point southward for the next 8 miles, there is a steady rise at the rate of 53 feet to the mile, culminating in a dome about two miles northwest of Calhoun, the elevation of the coal being 1750 feet at the highest point, but the coal dips again until at the point immediately west of Calhoun its elevation is only 1700 feet. From this point southward through the two counties, there is a steady and rapid rise along the axis at the rate of about 75 feet to the mile, the elevation at the last contour shown on Point Mountain being 4500 feet. The few domes and saddles described at the northern end of the anticline are only minor features, the general southward rise being by far the most conspicuous feature of the fold. The total rise from the Taylor County Line to the last contour on Point Mountain is 3250 feet, making an average of 61 feet per mile.

Marquess Anticline.—The Marquess Anticline, previously mentioned[5] but not hitherto named, is a slight fold, having its northern origin about one mile north of the village of Marquess, Preston County, and extending in a southwestward direction, crossing Sandy Creek into Barbour one mile southwest of Marquess, and dying out against the eastern slope of the Hiram Anticline about two miles west of Danville. It is a gentle and symmetrical fold, the dip on either side being much the same. The surface geology is that of the Conemaugh Series, the elevation of the Lower Kittanning Coal at the Preston Line being 1075 feet, and rising to only 1125 feet at the southern end of the fold.

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[5] Hennen and Reger, Preston Report, W. Va. Geol. Survey, p. 65; 1914.

Synclines.

Four synclines, the Grassland, Ligonier, Evansville, and Belington, are outlined on Maps II and IV.

Grassland Syncline.—The Grassland Syncline of Hennen[6], having its origin in southeastern Harrison about two miles north of Grassland and extending southwestward across Harrison, Upshur, and through Lewis and Gilmer, as previously described by the writer[7], cuts across the extreme northwestern corner of Upshur, entering from the north at a point 1.4 miles due south of Johnstown and passing into Lewis three-fourths mile southeast of Aberdeen, its general direction being northeast and southwest. The section in Upshur shows a symmetrical fold with a wide, shallow basin. The geology along the axis is that of the Monongahela and Conemaugh Series, the Pittsburgh Coal at the Harrison Line having an elevation of 1225 feet but descending to 1200 feet in the wide trough at the Lewis Line. One of the most prolific and spectacular oil fields of the State is located along the axis of this syncline in Lewis and Gilmer.

Ligonier Syncline.—The Ligonier Syncline, first named by the geologists of Pennsylvania from the Ligonier Valley in that State, enters West Virginia in northern Preston County, near Clifton Mills, from which point its course has been traced in previous Reports of the Survey[8] through Preston and Taylor to the Barbour Line. It enters northwestern Barbour one-third mile southeast of Astor, and extends southwestward in a course about 25 degrees west of south, crossing Simpson Creek 0.7 mile southeast of Astor, passing through the village of Pepper where it crosses Brushy Fork of Elk, crossing main Elk 1.8 miles east of Overfield, crossing Gnatty Creek 1.2 miles southeast of Peeltree, and entering Upshur 1.2 miles west of Century, and finally losing its identity against the great monocline of Upshur about one-half mile northeast of Ruraldale. Throughout its length in Barbour and Upshur, it is a wide, shallow basin, almost perfectly symmetrical about its axis, its course being nearly straight.

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[6] Ray V. Hennen, Doddridge-Harrison Report, W. Va. Geol. Survey, p. 65; 1912.

[7] Lewis and Gilmer Report, W. Va. Geol. Survey, p. 41; 1916.

[8] Hennen and Reger, Preston Report, W. Va. Geol. Survey, pp. 66-67; 1914; and Ray V. Hennen, Monongalia-Marion-Taylor Report, W. Va. Geol. Survey, pp. 88-89, 1913.

The surface geology along the axis, as shown by Map II, is that of the Dunkard, Monongahela, and Conemaugh Series, the first-named formation cropping only in some of the high hills and ridges. At the Taylor Line, the elevation of the Pittsburgh Coal is 1200 feet, but it rises southward along the axis, forming a long, flat saddle in the vicinity of Brushy Fork and main Elk, where, for five miles, the elevation is 1250 feet. At Gnatty Creek, the coal descends to a canoe-shaped trough, its elevation being only 1225 feet but south of Gnatty Creek it rises again until at Hackers Creek, in Upshur, it is 1325 feet. The location of this syncline through Barbour and Upshur can not be noticed by casual observation as the slopes are so gentle that the topographic forms are not affected, careful observations on the coal being necessary to determine its course.

Evansville Syncline.—The Evansville Syncline of Hennen[9], branching from the Ligonier Syncline near Independence, Preston County, and being separated from the parent fold by the Hiram Anticline, is a short, structural trough, entering northern Barbour at Dent, where it crosses Sandy Creek, and extending from that point southwestward about 4 miles to Big Cove Run where it is absorbed against the bold slope of the Hiram Anticline. The surface geology along its axis is that of the Conemaugh Series, the Lower Kittanning Coal having a tidal elevation of 1050 feet at the Preston Line, but rising steadily southwestward along the axis until at Big Cove Run it is 1125 feet. The fold lacks symmetry about its axis, the slope on the west being much less gentle than on the east.

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[9] Ray V. Hennen, Monongalia-Marion-Taylor Report, W. Va. Geol. Survey, p. 89; 1913.

Belington Syncline.—The Belington Syncline, previously mentioned[10] but not hitherto named, being by far the most important structural depression of the territory of this Report, has its origin in southern Preston about 1 mile northeast of Marquess, extends southwestward and enters northeastern Barbour 0.8 mile northwest of Colebank, veers sharply toward the west, crossing Raccoon Creek 1.3 miles southwest of Danville, turns almost due south, passes one-half mile east of Nestorville, three-fourths mile east of Kalamazoo, one-fourth mile east of Meadowville, directly through Huffman and through the western part of the town of Belington, having crossed the Tygart Valley River at the edge of town, extends on southward cutting through a bend of the river one mile south of Belington, and crossing again to the east side one-half mile southwest of Junior, entering Randolph one mile south of the latter point, and crossing the same stream for the last time one-fourth mile west of Harding. From Harding it continues at a course about 20 degrees west of south, passing through Coalton, and Fisher, passing 1.5 miles east of Cassity, and crossing Stonecoal Run one-fourth mile above its mouth. From Stonecoal Run its course is almost identical with that of the Middle Fork River to its head, the axis being only one-fourth mile east of West Huttonville. The fold dies out against the slope of the next eastern anticline, near the head of Mill Creek ten miles southwest of West Huttonsville.

For most of its length this syncline is not symmetrical about its axis, the slope on the west side being comparatively gentle toward the Hiram Anticline, to which it is closely parallel, but on the east the rise being sharp toward the great anticline which occurs along the Tygart Valley just east of the Laurel Ridge and Rich Mountain. The influence of this basin on the topography is pronounced. In northern Barbour in the region of Nestorville and Meadowville, the hills along the axis are low and rounded, having evidently been influenced by both the structural depression and by the peneplaning action of the waters, the entire effect being that of a great broad valley, emphasized by the high hills along the Hiram Anticline on the west and by the great Laurel Ridge and Rich Mountain on the east. The same condition continues southward into Randolph, but is less marked, owing to the fact that along the Middle Fork River, the surface rocks are more resistant.

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[10] Hennen and Reger, Preston Report, W. Va. Geol. Survey, p. 71; 1914.

The surface geology varies from that of the Monongahela Series, which tops a few of the high summits in eastern Barbour, through the entire range of the Conemaugh, Allegheny, and Pottsville sediments to the Mississippian rocks which crop south of Point Mountain in Randolph. North of Belington the Conemaugh is the principal surface series; between Belington and Fisher the Allegheny predominates and along the Middle Fork River and in the Point Mountain region, the Pottsville is supreme. This great variation in the surface rocks is due to the fact that the axis of the syncline is steadily and rapidly rising southward bringing these various rocks to the surface in succession. At the Barbour-Preston Line the elevation of the Lower Kittanning Coal is only 1075 feet. From this point southward to Belington, the rise is gradual, being only 27 feet to the mile, but from Belington, where the coal is 1425 feet above sea-level, southward, the rise averages 70 feet to the mile to West Huttonsville where the coal, if present, would be at an elevation of 2900 feet. From West Huttonsville southward, the axis rises even more rapidly, causing the fold to lose its identity in the general southward slope.

Unconformities and Faults.

So far as known there are no unconformities in the Pennsylvanian rocks of the three counties. There is the usual amount of thickening and thinning locally between the different members that form the various series of these rocks, but they seem to be the result of irregular deposition on a flat surface rather than an interruption of sequence caused by intermediate folding and consequent erosion.

At the base of the Pennsylvanian, however, there is the usual unconformity between the Pottsville and the Mauch Chunk of the Mississippian, caused by the long season of aerial conditions and erosion that must have elapsed, as indicated by the complete oxidation of the Mauch Chunk sediments. On the east side of the Laurel Ridge, along the Morgantown and Beverly Turnpike, the writer noted an almost complete absence of Greenbrier Limestone and Pocono Sandstones, these two formations being represented by only about 40 feet of yellow and gray sediments, one foot of which in the upper half contained abundant marine fossils, coming between the undoubted red shales of the Mauch Chunk above and the typical red shales and sandstones of the Catskill below, the same condition being found along the east side of the mountain at the next hill road two miles farther south, near the Laurel Hills School. Whether the absence of these two series, ordinarily totaling about 600 feet, be due to an unconformity, as the writer thought at the time, or, as Dr. White suggests, to an overthrust fault, future study will determine. It is unfortunate that no drillings have been made through these measures in the region around Belington, west of these outcrops, where their thickness might be accurately determined.

In the region of this Report proper, west of the Laurel Ridge and Rich Mountain, no faults of any kind are known to exist, as the structural slopes are much too gentle to favor their occurrence.

CHAPTER IV.

STRATIGRAPHY—GENERAL SECTIONS

INTRODUCTION.

The surface rocks of Barbour, Upshur, and western Randolph embrace the Quaternary, Permo-Carboniferous, Pennsylvanian, Mississippian, and Upper Devonian. The latter rocks crop at only one point in eastern Barbour, but a considerable amount of information regarding their thickness and character underground is available from oil and gas well borings in various parts of the territory.

The following classification of the rocks available for study shows their succession in convenient form, arranged in descending order:

Age.	Period.	Series.
Quaternary	Recent	Present Formation.
	Pleistocene	River Terrace Deposits.
Paleozoic	Permo-Carboniferous.	Dunkard (200').
	Pennsylvanian	Monongahela (400').
		Conemaugh (550'-650').
		Allegheny (200'-250').
		Pottsville, embracing: Kanawha and New River Groups (400'-1050')
	Mississippian	Mauch Chunk (200'-600').
		Greenbrier Limestone (50'-250').
		Pocono Sandstones (250'-450').
	Devonian	Catskill (400'-700').
		Chemung, 1500' (?).

The Quaternary Rocks, represented by clays, gravels, and sand beds, present in this area along the river and creek bottoms, and by Pleistocene river terrace deposits, having a mainly occurrence at a few points along higher levels in the river valleys, are shown on Maps II and IV under the general title of alluvium. As an agricultural soil they form a valuable economic resource in all these counties.

The Permo-Carboniferous Rocks, represented by the Dunkard Series and shown by coloring on Maps II and IV in western Barbour and northern Upshur, comprise a transitional or intermediate period between the true Carboniferous and the Permian above. In these counties the Dunkard beds consist of massive brown or gray sandstones, separated by sandy and red shales, only the two lower sandstone members, the Mannington and Waynesburg, being found. As these beds lack much of their characteristic soil-forming qualities, and have no coals or other economic deposits associated with them in this area, they were not studied in detail. The Dunkard beds have been fully described in numerous reports for the northwestern counties where they occur in typical form.

The rocks of the Pennsylvanian Period comprise the great bulk of the surface sediments. The four Series; viz., the Monongahela, Conemaugh, Allegheny, and Pottsville, crop to the surface successively from the northwest to the southeast. In southern Randolph the three former disappear completely above the mountain tops, leaving only the Pottsville.

The Mississippian, comprising the Mauch Chunk, Greenbrier and Pocono, crop in some of the deep creek and river valleys along the Laurel Ridge, Rich Mountain, and in the southern portion of Randolph described.

The Devonian Rocks, represented by the Catskill and Chemung, crop at only one point along the Laurel Ridge in eastern Barbour.

Numerous geologic sections, consisting usually of careful [illegible] measurements combined with the records of oil and gas and coal test borings, and showing the stratigraphic succession from the Permo-Carboniferous to the Devonian, will be given in the following pages.

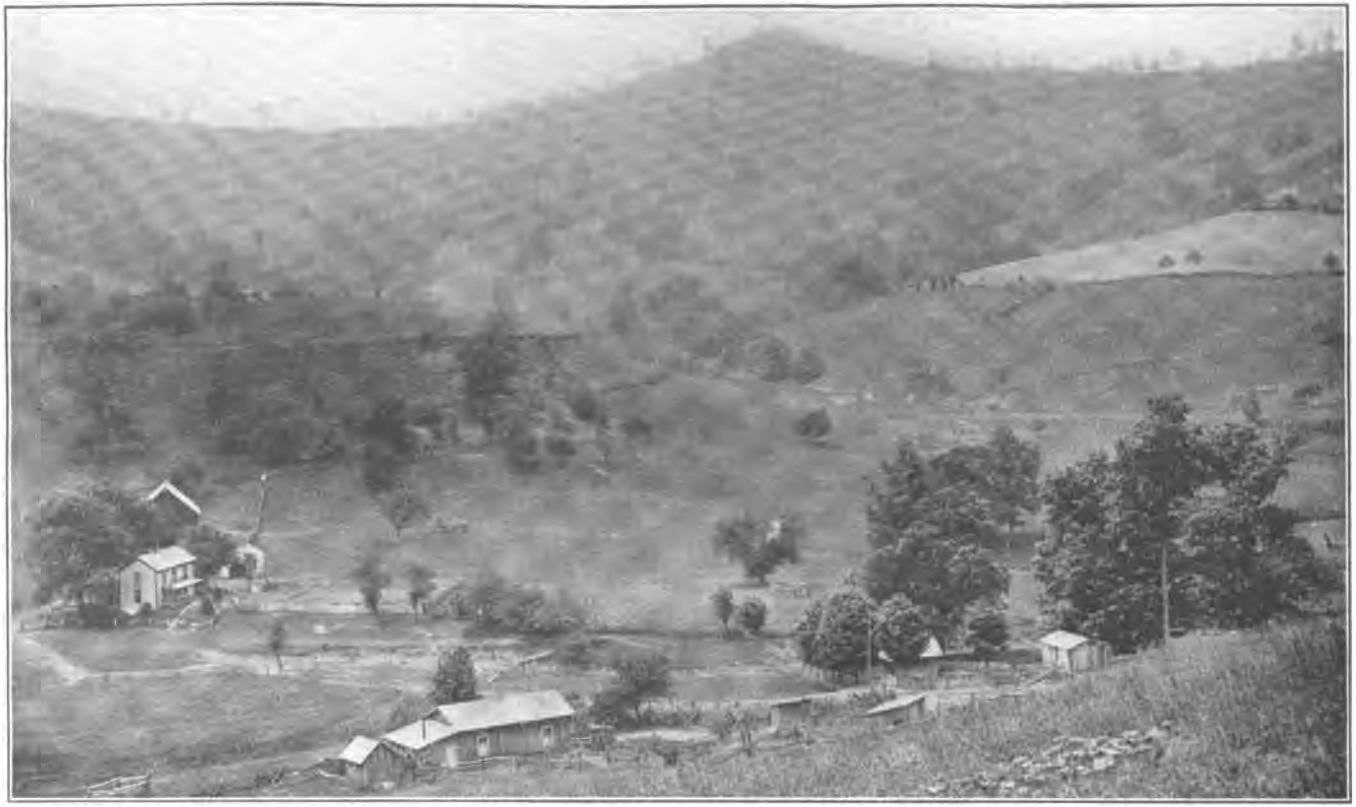

PLATE V.—View of Bear Knob on Hackers Creek, Upshur County, capped by the Dunkard Series; the Monongahela occupies the steep slopes just below down to the level of the broad terraces at right and left, the Conemaugh coming below this shelf.

scanty occurrence at a few points along higher levels in the river valleys, are shown on Maps II and IV under the general title of alluvium. As an agricultural soil, they form a valuable economic resource in all these counties.

The Permo-Carboniferous Rocks, represented by the Dunkard Series and shown by outcrop on Maps II and IV in western Barbour and northern Upshur, comprise a transitional or intermediate period between the true Carboniferous and the Permian above. In these counties the Dunkard beds consist of massive brown or gray sandstones, separated by sandy and red shales, only the two lower sandstone members, the Mannington and Waynesburg, being found. As these beds lack much of their characteristic cliff-forming qualities, and have no coals or other economic deposits associated with them in this area, they were not studied in detail. The Dunkard beds have been fully described in numerous reports for the northwestern counties where they occur in typical form.

The rocks of the Pennsylvanian Period comprise the great bulk of the surface sediments. The four Series; viz, the Monongahela, Conemaugh, Allegheny, and Pottsville, crop to the surface successively from the northwest to the southeast. In southern Randolph the three former disappear completely above the mountain tops, leaving only the Pottsville.

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Numerous geologic sections, consisting usually of careful hand-level measurements combined with the records of oil and gas and coal test borings, and showing the stratigraphic succession from the Permo-Carboniferous to the Devonian, will be given in the following pages.

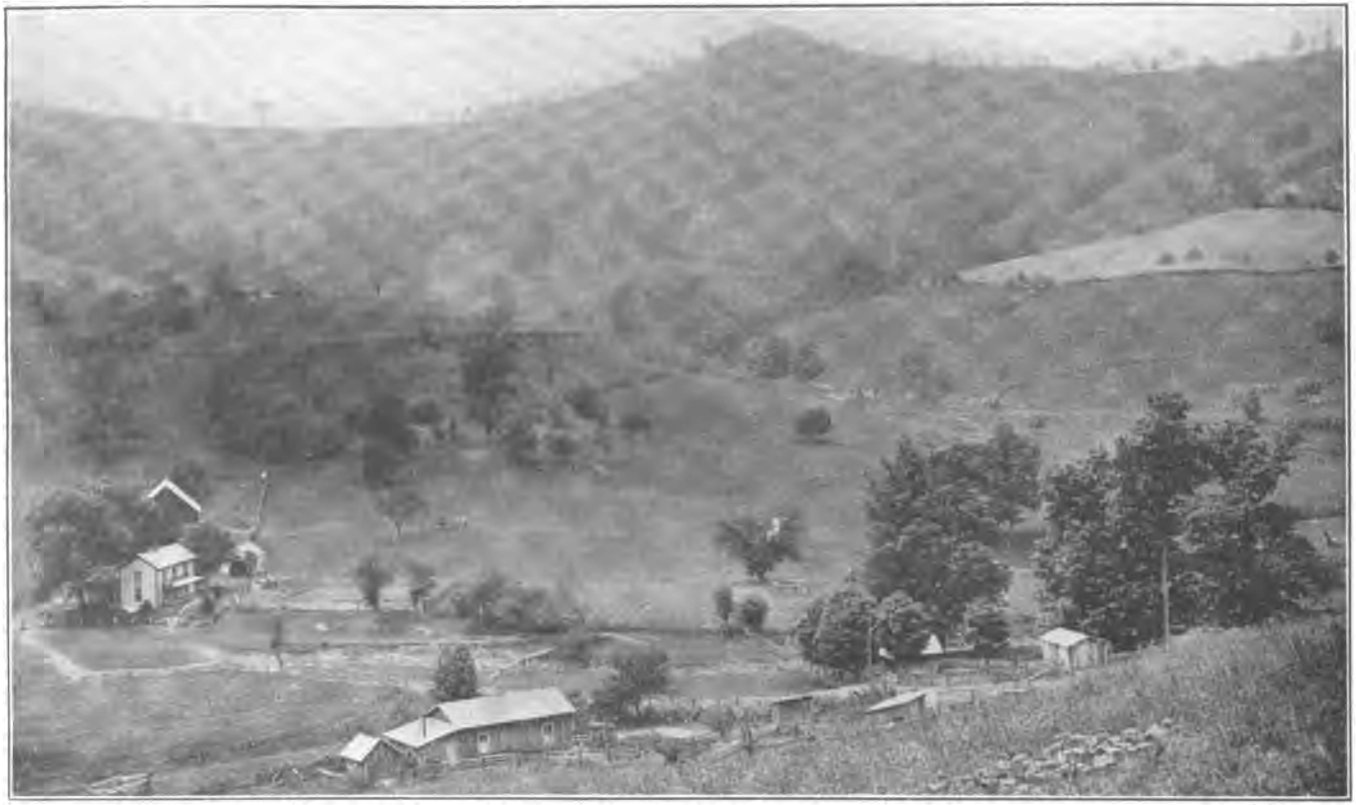

PLATE V.—View of Bear Knob on Hackers Creek, Upshur County, capped by the Dunkard Series; the Monongahela occupies the steep slopes just below down to the level of the broad terraces at right and left, the Conemaugh coming below this shelf.

BARBOUR COUNTY SECTIONS.

GENERAL SECTIONS, PLEASANT DISTRICT, BARBOUR.

Pleasant District is situated in the northwestern corner of Barbour, its surface rocks ranging from the Dunkard, through the Monongahela, Conemaugh, and Allegheny.

The following section, measured with aneroid by Teets, starts at the top of a hill on West Branch of Simpson Creek, 2.3 miles southwest of Astor, and connects with the record of the Thurman Cole No. 1 (3) well, a dry hole drilled by the Constant Oil Company:

Astor Section, Pleasant District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (250')			
Shale, sandy, and concealed	50	50	
Sandstone, massive, Arnoldsburg	20	70	
Shale, sandy, Fulton	5	75	
Limestone, hard, gray, Benwood	5	80	
Concealed and sandy shale	28	108	
Coal blossom, Sewickley	2	110	110'
Concealed and shale, sandy	25	135	
Sandstone, Lower Sewickley	15	150	
Shale, sandy, and concealed	59	209	
Coal blossim, Redstone (1315' B.)	1	210	100'
Concealed and shale, sandy	36	246	
Coal blossom, Pittsburgh (1275' B.)	4	250	40'
Conemaugh Series (630')			
Shale, sandy, and concealed	49	299	
Coal blossom, Little Pittsburgh (1225' B.)	1	300	
Concealed and shale, sandy, to top of well	90	390	
Continued by Thurman Cole No. 1 (3) Well Record (1135' B.):			
Unrecorded	400	790	
Sand, Big Dunkard	90	880	
Allegheny and Pottsville Series (560')			
Unrecorded	510	1390	
Sand, Salt	50	1440	
Mauch Chunk Series (260')			
Unrecorded (limestone shells at 1440')	200	1640	
Sand, Maxton	60	1700	
Greenbrier Limestone (75')			
Big Lime	75	1775	
Pocono Sandstones (415')			
Sand, Big Injun	120	1895	
Unrecorded	295	2190	
Catskill Series (115')			
Sand, Gantz	10	2200	
Slate and shells	40	2240	
Sand, Fifty-foot, to bottom	65	2305	

The following section, measured with aneroid by Teets, starts at the top of a high hill, at the head of Pigtail Run in the edge of Simpson District, Harrison County, 3 miles northwest of Pepper, and continues down the hill road to the head of the run, and shows the Redstone Limestone, an important horizon coming between the Redstone and Pittsburgh Coals and often aiding in their identification:

Pigtail Run Section, Simpson District, Harrison.

	Thickness. Feet.	Total. Feet.	
Dunkard and Monongahela Series (420')			
Shale, sandy, and concealed	125	125	
Shale, sandy	60	185	
Sandstone, **Arnoldsburg**, and shale	38	223	
Limestone, **Benwood**	2	225	
Shale, sandy, and sandstone	80	305	
Bench, concealed, and shale	10	315	
Shale, sandy	35	350	
Bench, sandy shale	5	355	
Shale, sandy, and sandstone	20	375	
Coal blossom, Redstone (1355' B.)	5	380	380'
Shale, slaty	15	395	
Limestone, Redstone	4	399	
Shale, sandy, and concealed	15	414	
Coal, Pittsburgh (1315' B.)	6	420	
Conemaugh Series (145')			
Shale, sandy and red, and concealed	123	543	
Coal blossom, Little Clarksburg (1190' B.)	2	545	
Concealed to run	20	565	

The following section, measured with aneroid by Teets, starts at the top of a high hill, one-half mile west of Berryburg, and continues down to the mines at the town. Owing to the rapid eastward rise in the rocks, the intervals do not represent true vertical measurement, being much too small:

Berryburg Section, Pleasant District.

	Thickness. Feet.	Total. Feet.
Monongahela Series (400')		
Concealed to large bench	70	70
Shale, sandy	35	105
Shale, red	10	115
Shale, sandy	20	135
Shale, red and sandy	30	165
Shale, red	20	185
Shale, sandy	10	195

	Thickness. Feet.	Total. Feet	
Sandstone, Arnoldsburg	35	230	230'
Concealed to bench	40	270	
Bench, shale and concealed	50	320	
Shale, sandy, and concealed	60	380	
Limestone, Redstone	2	382	
Shale and slate	9	391	
Coal ......4' 8" **Coal, hard**..0 5 **Coal** ....4 4 } **Pittsburgh** (9' 5") (1410' B.) (Consolidation Coal Co. Mine No. 37—No. 89 on Map II)	9	400	170'
Conemaugh Series (5')			
Slate and concealed	5	405	

The following section, the upper portion of which was measured with aneroid by Teets, down a steep hill on the west side of the Tygart Valley River, three-fourths mile north of Berryburg Junction, and the lower part of which is from data secured by Ray V. Hennen at the shaft of the Midland Coal and Coke Company and published in Volume II(A), pages 515 and 578, of the Survey, shows the Allegheny coals as they occur in that vicinity, the Upper Freeport being either absent or concealed:

Berryburg Junction Section, Pleasant District.

	Thickness. Ft.	In.	Total. Ft.	In.	
Conemaugh Series (170')					
Shale, sandy, and concealed	65	0	65	0	
Bench, concealed	10	0	75	0	
Concealed	45	0	120	0	
Bench, shale, sandy	5	0	125	0	
Sandstone and shale, sandy	25	0	150	0	
Bench, concealed	5	0	155	0	
Concealed	15	0	170	0	170'
Allegheny Series (181' 0¾")					
Shale, sandy	20	0	190	0	
Sandstone, gray, buff, Upper Freeport	18	0	208	0	
Concealed	4	0	212	0	
Shale, gray	9	0	221	0	
Coal ....0' 6" Slate ......0 1 **Coal** ....0 6 **Coal, bony**..0 8 } **Lower Freeport** (1342' B.) (Mine No. 457 on Map II)	1	9	222	9	52' 9"
Shale, sandy, and concealed	14	3	237	0	
Sandstone	7	0	244	0	
Shale and concealed to top of shaft	11	0	255	0	

Continued by shaft record of Midland Coal & Coke Co. and section in mine:

		Thickness. Ft.	In.	Total. Ft.	In.	
Surface, gravel, etc.		15	0	270	0	
Sandstone, hard, Lower Freeport		27	0	297	0	
Coal, soft, slightly bony at top 1' 2" Slate, soft 0 0½ Coal, soft 0 10 Slate, black 0 1 Coal, soft 1 10 Slate, gray, with streaks of coal...0 11 Coal, soft 0 10	Upper Kittanning (1262' B.) (Midland C. & C. Co. Mine, No. 476 on Map II)	5	8½	302	8½	79' 11½"
Sandstone, white, very hard, East Lynn		40	0	342	8½	
Slate, good roof		3	0	345	8½	
Coal, soft. 2' 0" Coal, bony. 0 7 Coal, soft. 0 9 Bone ....0 0¼ Coal, soft. 2 0	Lower Kittanning (1214' B.) (Midland C. & C. Co., Mine,.. No. 555 on Map II)	5	4¼	351	0¾	48' 4¼"

GENERAL SECTIONS, ELK DISTRICT, BARBOUR.

Elk District lies southwest of Pleasant, and its surface rocks include the lower Dunkard, the Monongahela, and the upper portion of the Conemaugh Series.

The following section was measured with aneroid by Teets, descending a hill road to the northern branch of Stonecoal Run, 2.5 miles eastward from Grassland:

Stonecoal Run Section, Elk District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (190')			
Sandstone, Arnoldsburg	20	20	20
Shale, sandy, Fulton	19	39	
Limestone, Benwood	1	40	
Shale, sandy, and sandstone, Upper Sewickley	25	65	
Shale, limy	1	66	
Sandstone, Lower Sewickley	23	89	69'
Shale, limy, dark	1	90	
Shale, sandy	25	115	

	Thickness. Feet.	Total. Feet.	
Sandstone, Cedarville, and sandy shale	23	138	
Coal blossom, Redstone	2	140	51
Fire clay	2	142	
Shale, sandy, and concealed	45	187	
Coal blossom, Pittsburgh (1345′ B.)	3	190	50
Conemaugh Series (110′)			
Shale, sandy, and concealed	82	272	
Fire clay	3	275	
Shale, sandy, and concealed, to run	25	300	

In the following section, arranged in descending order, the upper portion was measured with hand-level by Teets up the steep hill immediately south of Overfield. The lower portion is the record of the J. C. Benson No. 3612 well (10), drilled by the Hope Natural Gas Company in 1914-15, having a total depth of 4570 feet, and ranking as one of the deepest producing gas wells of the State. It is unfortunate that this boring was not continued to the Oriskany Sand which probably would have been found at an additional depth of less than 2500 feet.* This well made several shows of gas and will be discussed in more detail in Chapter X:

Overfield Section, Elk District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (90′)			
Concealed	85	85	
Coal, Pittsburgh, (abandoned opening) about	5	90	90
Conemaugh and Allegheny Series (865′)			
Concealed	110	200	
Sandstone, massive	27	227	
Coal, Little Clarksburg (1146′ L.) (prospect No. 192 on Map II)	3	230	140
Shale, limy	2	232	
Limestone, Clarksburg	3	235	
Concealed	112	347	
Limestone, Elk Lick	3	350	
Concealed to top of well			
Continued by J. C. Benson No. 3612 (10) Well Record (1026′ L.):			
Unrecorded	250	600	
Sand, Big Dunkard and Burning Springs	150	750	
Unrecorded	98	848	

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*Since this well was drilled, a deep boring by the same company (Hope) on the Martha Goff farm near Bridgeport, Harrison County, got the top of the Corniferous Limestone at 7250 feet below the Pittsburgh Coal, or 2900 feet below the Benson Sand.

	Thickness. Feet.	Total. Feet.	
Gas Sand (gas, 498')	22	870	
Unrecorded (water, 570')	85	955	
Pottsville Series (345')			
Sand, First Salt or Second Cow Run (water, 660')	195	1150	
Unrecorded	120	1270	
Sand, Salt	30	1300	
Mauch Chunk Series (285')			
Unrecorded	255	1555	
Little Lime	25	1580	
Pencil Cave	5	1585	1355'
Greenbrier Limestone (90')			
Big Lime (gas, 1260')	90	1675	
Pocono Sandstones (428')			
Sand, Big Injun, (gas, 1330' and 1430'; water, 1430')	105	1780	
Unrecorded	185	1965	380'
Sand, Berea (water, 1672'; gas, 1664')	138	2103	
Catskill Series (436')			
Unrecorded	71	2174	
Sand, Fifty-foot	13	2187	
Unrecorded	7	2194	
Sand, Thirty-foot	109	2303	
Unrecorded	30	2333	
Sand, Gordon Stray	5	2338	
Unrecorded	8	2346	381'
Sand, Gordon	9	2355	
Unrecorded	44	2399	
Sand, Fourth	8	2407	
Unrecorded	83	2490	144'
Sand, Fifth	49	2539	
Chemung and Portage Series (2381')			
Unrecorded (water, 2535')	441	2980	490'
Sand, Warren	10	2990	
Unrecorded (gas, 2879')	420	3410	
Lime sand	135	3545	
Unrecorded (lime at 3400')	205	3750	
Shells	260	4010	
Grit and shells	95	4105	
Pink rock	10	4115	
Slate, dark	324	4439	1459'
Sand, Benson (Bradford ?) (gas, 4090')	9	4448	
Unrecorded	2	4450	
Lime shells to bottom	470	4920	

The following section was measured with aneroid by Teets down a steep hill road to Brushy Fork of Elk Creek, 1.2 miles west of Pepper:

Pepper Section, Elk District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (150')			
Sandstone, Upper Sewickley	25	25	
Concealed	95	120	
Sandstone	15	135	
Shale and slate	6	141	
Coal, Pittsburgh (8' 11") (1335' B.) (John Stone Mine, No. 124 on Map II)	9	150	150'
Conemaugh Series (255')			
Shale, sandy, and sandstone	75	225	
Shale, red	10	235	
Shale, sandy	5	240	
Sandstone, Connellsville	20	260	
Shale, sandy	28	288	
Coal, Little Clarksburg, (Exposure No. 187 on Map II) (1195' B.)	2	290	140'
Shale, limy	1	291	
Limestone, Clarksburg	2	293	
Shale, sandy	37	330	
Shale, red, limy, Clarksburg	15	345	
Fire clay	2	347	
Shale, sandy, and concealed	47	394	
Coal, Elk Lick (1090' B.)	1	395	105'
Concealed to Brushy Fork	10	405	

The following section was measured with aneroid by Teets, descending a hill road at the head of the southern branch of Stewart Run, 2.2 miles due east of Pepper:

Stewart Run (Southern Branch) Section, Elk District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (330')			
Sandstone, Uniontown, massive, coarse-grained	20	20	20'
Shale, sandy, and concealed	35	55	
Bench, concealed	5	60	
Shale, sandy, and concealed	30	90	
Shale, red	10	100	
Sandstone, flaggy, Arnoldsburg	20	120	
Concealed in bluff	40	160	
Bench	5	165	
Shale, red	9	174	
Shale, dark, Sewickley Coal horizon	1	175	155'
Shale, green, limy	5	180	
Shale, sandy, gray	33	213	
Limestone, impure, yellowish, Sewickley	2	215	
Shale, red and sandy, to bench	55	270	
Shale, sandy, and concealed	20	290	
Coal, Redstone, impure	2	295	120'
Shale, sandy, and concealed	29	324	

	Thickness. Feet.	Total. Feet.	
Coal, Pittsburgh	6	330	35′
Conemaugh Series (30′)			
Concealed	30	360	

The following section, measured with aneroid by Tects down a steep hill road at the head of the most northern branch of Stewart Run, shows the entire Monongahela, as well as portions of the Dunkard and Conemaugh:

Stewart Run (Northern Branch) Section, Elk District.

	Thickness. Feet.	Total. Feet.	
Dunkard Series (30′)			
Concealed	5	5	
Sandstone, massive, medium-grained, **Waynesburg**	25	30	30′
Monongahela Series (405′)			
Concealed	40	70	
Sandstone, flaggy, **Gilboy**	25	95	
Concealed and bench	20	115	
Shale, sandy	10	125	
Sandstone, **Uniontown**	30	155	125′
Shale, sandy, and concealed	60	215	
Sandstone, **Arnoldsburg**	15	230	
Shale, sandy	29	259	
Coal blossom, (0′ 7″), Lower Uniontown	1	260	105′
Shale, red, limy	5	265	
Shale, sandy	30	295	
Shale, red	5	300	
Shale, sandy	10	310	
Shale, green	3	313	
Shale, sandy	7	320	
Sandstone, **Lower Sewickley**	20	340	
Shale, sandy	13	353	
Limestone, hard, yellowish, **Sewickley**	2	355	
Shale, sandy, and concealed	20	375	
Sandstone, **Cedarville**	10	385	
Slate and shale	7	392	
Coal, Redstone (1380′ B.)	3	395	135′
Slate and concealed	20	415	
Limestone, **Redstone**	3	418	
Slate and concealed	8	426	
Coal ....4′ 0″ **Coal, hard**..0 6 **Coal** ....4 6 } **Pittsburgh** (1340′ B.) (**McKinney Mine, No. 140 on Map II**)	9	435	40′
Conemaugh Series (75′)			
Slate and concealed	43	478	
Coal blossom, Little Pittsburgh (**Coal Exposure No. 184 on Map II**)	2	480	45′
Shale, sandy, and concealed, to run	30	510	

The following section, arranged in descending order, was measured with hand-level by Teets up the steep hill just northwest of Elk City, and connects with the Robert Wood Coal Test (No. 3 on Map II), the record of which, unfortunately, could not be obtained. Owing to the eastward rise of the rocks, the intervals are shorter than true vertical measurement would show:

Elk City Section, Elk District.

Conemaugh Series (334')	Thickness. Feet.	Total. Feet.
Sandstone, conglomeratic, **Lower Connellsville**	20	20
Shale, sandy, and concealed	30	50
Shale, red, limestone nodules	13	63
Concealed	16	79
Shale, sandy	22	101
Concealed, bench	22	123
Sandstone, massive, medium-grained, buff, **Grafton**	33	156
Concealed	44	200
Bench, concealed	5	205
Concealed	17	222
Sandstone, massive, medium-grained, **Saltsburg**	33	255
Shale, sandy	13.5	268.5
Coal, Bakerstown (1' 6") (1140' L.)	1.5	270
Shale, sandy	42	312
Limestone, hard, bluish-gray, **Brush Creek**	3	315
Shale, sandy	5	320
Sandstone, massive, to top of Robert Wood Coal Test (3) (1086' L.)	14	334

The following section, arranged in descending order, was made by Teets, with aneroid, along the hill road at the head of Beech Lick of Elk Creek, 2.7 miles westward from Elk City:

Beech Lick Section, Elk District.

Monongahela Series (385')	Thickness. Feet.	Total. Feet.	
Concealed	25	25	
Sandstone, **Gilboy**	10	35	
Concealed	35	70	
Sandstone, **Uniontown**, and concealed	50	120	
Reds and concealed	40	160	
Sandstone, flaggy, **Arnoldsburg**	35	195	195'
Shale, sandy, and concealed	13	208	

	Thickness. Feet.	Total. Feet.	
Limestone, **Benwood**	2	210	
Shale, sandy	15	225	
Shale, red, along bench	10	235	
Shale, sandy	45	280	
Bench	10	290	
Shale, sandy, and concealed	59	349	
Fire clay, **Redstone Coal horizon**	1	350	155'
Shale, sandy, and concealed	30	380	
Coal, Pittsburgh (1335' B.)	5	385	35'
Conemaugh Series (210')			
Shale, sandy, and concealed	159	544	
Coal blossom, Normantown (1175' B.)	1	545	160'
Limestone	4	549	
Shale, sandy	26	575	
Sandstone, massive, buff, **Morgantown**, to run	20	595	

The following section was made by Teets with aneroid, descending the hill road at the extreme head of Arnold Run of Elk Creek, 2 miles northeast of Peeltree, and being near the axis of the Ligonier Syncline exposes the lower part of the Dunkard, as well as all the Monongahela and part of the Conemaugh Series:

Arnold Run Section, Elk District.

	Thickness. Feet.	Total. Feet.
Dunkard Series (105')		
Concealed	15	15
Sandstone and concealed in bluff	50	65
Concealed	10	75
Sandstone, coarse-grained, **Waynesburg**	30	105
Monongahela Series (405')		
Concealed	40	145
Shale, red	10	155
Sandstone, **Gilboy**, and concealed	10	165
Shale, dark-red	20	185
Shale, sandy, and sandstone, **Uniontown**	29	214
Limestone, hard, gray, **Uniontown**	1	215
Shale, sandy, and concealed	20	235
Bench, concealed	10	245
Concealed	5	250
Shale, dark-red	10	260
Shale, sandy, and sandstone	30	290
Concealed	35	325
Sandstone, flaggy, micaceous, **Upper Sewickley**	15	340
Shale, sandy	9	349
Coal blossom, Sewickley (1400' B.)	1	350
Shale, sandy, and concealed	35	385
Bench, concealed	10	395

	Thickness. Feet.	Total. Feet.
Shale, sandy, and concealed	30	425
Sandstone, flaggy, **Cedarville**	10	435
Shale, sandy, and concealed	35	470
Coal, Redstone (1275′ B.)	5	475
Concealed	29	504
Coal, Pittsburgh (1240′ B.)	6	510
Conemaugh Series (15′)		
Concealed to run	15	525

GENERAL SECTIONS, UNION DISTRICT, BARBOUR.

Union District occupies the southwestern edge of Barbour, next to Upshur, and has a range in surface rocks from the Dunkard along the Ligonier Syncline on the west, down through the Monongahela, Conemaugh, Allegheny, and into the Pottsville at the southeastern end of the District.

The following section was made by Teets with aneroid, descending the steep hill just east of Peeltree and is tied to the Taylor Ward No. 1 (14) well, the record of which could not be secured:

Peeltree Section, Union District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (330′)			
Sandstone, flaggy, **Uniontown**	20	20	20′
Concealed	59	79	
Limestone, hard, gray	1	80	
Concealed	20	100	
Shale, sandy, and concealed	40	140	
Bench, concealed	5	145	
Concealed	20	165	
Bench, concealed	5	170	
Shale, red	10	180	
Shale, sandy, and concealed	30	210	
Sandstone, **Lower Sewickley**	15	225	
Shale, sandy	60	285	
Coal, Redstone, (1275′ B.) (abandoned opening) about	5	290	270
Concealed	33	323	
Coal, Pittsburgh (7′ 4″) (1235′ B.) (N. B. White Mine, No. 144 on Map II)	7	330	40
Conemaugh Series (150′)			
Shale, sandy, and concealed	95	425	
Sandstone, massive, **Connellsville**	20	445	
Shale, sandy	9	454	
Coal, impure, Little Clarksburg (Exposure No. 194 on Map II) (1110′ B.)	1	455	125′
Shale, dark, limy	2	457	

	Thickness. Feet.	Total. Feet.
Limestone, hard, gray, **Clarksburg**	2	459
Shale, sandy, and concealed, to top of Taylor Ward No. 1 (14) Well (1085' B.)	21	480

In the following section, the upper portion was made by Teets with aneroid, descending a high hill on the head of the Left Fork of Gnatty Creek, 2 miles northeast of Century. The lower portion is the record of the T. O. Martin No. 1 (15) Well, drilled by Randolph and Davis, and completed January 23, 1915, which was abandoned as a dry hole although it was reported to have made a 5-barrel show of oil in the Squaw Sand, the record being furnished the Survey by Cleo. Swecker, Civil Engineer, of Century:

Century Section, Union District.

	Thickness. Feet.	Total. Feet.	
Dunkard Series (55')			
Sandstone	15	15	
Concealed	10	25	
Sandstone, coarse-grained, **Waynesburg**	30	55	55'
Monongahela Series (395')			
Concealed	45	100	
Shale, red	10	110	
Sandstone, **Gilboy, sandy shale**	20	130	
Shale, dark-red	10	140	
Shale, sandy, and sandstone, **Uniontown**	19	159	104'
Limestone, hard, gray, **Uniontown**	1	160	
Shale, sandy, and concealed, to bench	25	185	
Concealed	10	195	
Shale, dark-red	10	205	
Shale, sandy, and sandstone, **Arnoldsburg** ...	30	235	
Concealed	35	270	
Sandstone, **Upper Sewickley**	15	285	
Shale	9	294	
Coal blossom, Sewickley	1	295	186'
Shale, sandy, and concealed	35	330	
Concealed in bench	10	340	
Shale, sandy, and concealed	30	370	
Sandstone, **Cedarville**	15	385	
Concealed	20	405	
Coal, Redstone	5	410	115'
Concealed	33	443	
Coal, Pittsburgh (1350' B.)	7	450	40'
Conemaugh Series (590')			
Concealed	148	598	
Coal, Little Clarksburg (Exposure No. 198 on Map II)	2	600	150'
Limestone, **Clarksburg**	2	602	

	Thickness. Feet.	Total. Feet.	
Shale, red, to top of well	38	640	
Continued by T. O. Martin No. 1 (15) Well Record (1160' B.):			
Unrecorded	235	875	
Sand, Little Dunkard	73	948	
Unrecorded	43	991	
Sand, Big Dunkard	49	1040	440
Allegheny Series (220')			
Unrecorded	110	1150	
Gas Sand	20	1170	
Unrecorded	45	1215	
Sand	35	1250	
Coal (about 10') Lower Kittanning?	10	1260	220
Pottsville Series (502')			
Sand, First Salt, Homewood	110	1370	
Unrecorded	30	1400	
Sand, Second Salt	188	1588	
Unrecorded	5	1593	
Sand, Third Salt	169	1762	
Mauch Chunk Series (123')			
Slate	14	1776	
Red rock	54	1830	
Unrecorded	15	1845	
Little Lime	35	1880	
Unrecorded	5	1885	625'
Greenbrier Limestone (55')			
Big Lime	55	1940	
Pocono Sandstones (325')			
Sand, Big Injun	20	1960	
Unrecorded	10	1970	
Slate	10	1980	
Red rock and shells	30	2010	
Slate and sand	30	2040	
Slate	15	2055	
Sand, Squaw (oil, 1443', 5-bbl. show)	60	2115	
Unrecorded	5	2120	
Sand, Weir	70	2190	
Red rock	3	2193	308'
Sand, Berea	72	2265	
Catskill Series (695')			
Slate and shells	25	2290	
Red grit	48	2338	
Unrecorded	100	2438	
Slate (water at 1735')	31	2469	
Sand, Thirty-foot	50	2519	
Unrecorded	96	2615	
Sand, Gordon Stray	15	2630	437'
Sand, red, Gordon, Fourth, Fifth and Bayard	280	2910	
Sand, Elizabeth	40	2950	
Red rock	10	2960	
Chemung Series (340')			
Slate	9	2969	
Sand, Warren First?	26	2995	
Slate and shells	24	3019	
Sand, Warren First?	21	3040	

	Thickness. Feet.	Total. Feet.	
Slate and shells	110	3150	
Unrecorded	5	3155	525′
Sand, Warren Second?	30	3185	
Slate and shells to bottom	115	3300	

The following section was made with aneroid by Teets along the hill road just southwest of Hall on the Buckhannon River. The intervals are somewhat too short as the measurements were made on the rise of the rocks:

Hall Section, Union District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (125′)			
Shale, sandy, and concealed	10	10	
Sandstone, massive, brown, pebbly, quarry rock, Buffalo	10	20	
Shale, sandy, and concealed	105	125	
Allegheny Series (185′)			
Coal, Upper Freeport, (prospect fallen shut) (1560′ B.)	5	130	130′
Shale, sandy, and sandstone	5	135	
Sandstone, gray, pebbly, ferriferous, Upper Freeport	9	144	
Coal, impure, Lower Freeport (1545′ B.)	1	145	15′
Sandstone 15′ Shale, yellow, with iron concretions 5 Sandstone, shelly 10 Lower Freeport Sandstone	30	175	
Shale, gray, with ferriferous streaks	14.5	189.5	
Coal blossom, Upper Kittanning, (1500′ B.)	0.5	190	45′
Shale, limy	1.5	191.5	
Limestone, hard, Johnstown	2	193.5	
Shale, gray	16.5	210	
Sandstone, fine-grained, cross-bedded, East Lynn	10	220	
Shale, sandy, and concealed	33	253	
Coal blossom, Middle Kittanning (1435′ B.)	2	255	65′
Shale, sandy	10	265	
Sandstone 10′ Shale, sandy 5 Sandstone, massive, coarse-grained, pebbly 15 East Lynn	30	295	
Coal, blocky 2′ 0″ Slate, gray 1 0 Coal, soft, visible 1 11 Lower Kittanning (4′ 11″) (1390′ B.) (J. P. Newcomb Mine, No. 563 on Map II).	5	300	45′
Concealed to bed of Buckhannon River	10	310	

The following section, measured with aneroid by Teets, shows the succession descending the steep hill just northwest of Audra, at the extreme southeastern corner of the District, where the upper portion of the Pottsville is above drainage:

Audra Section, Union District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (220')			
Sandstone and concealed	32	32	
Coal, Lower Freeport, (1910' B.), opening fallen shut (No. 462 on Map II), reported	3	35	35'
Concealed	102	137	
Coal, Middle Kittanning, (reported), opening fallen shut (1805' B.)	3	140	105'
Concealed and sandstone, East Lynn	29	169	
Coal, soft....1' 6" Shale, slaty..1 5 Coal ....0 6 Shale, slaty..0 8 Coal, soft....2 1 Lower Kittanning (1770' B.) (B. & O. R. R. Co. Mine—No. 565 on Map II) (6' 2")	6	175	35'
Shale, slaty	5	180	
Sandstone, massive, pebbly, Clarion	30	210	
Shale, sandy	10	220	
Pottsville Series (55')			
Sandstone, massive.......15' Shale, sandy............ 5 Sandstone, massive, coarse-grained to Middle Fork River ....35 Homewood	55	275	

GENERAL SECTIONS, PHILIPPI DISTRICT, BARBOUR.

Philippi District occupies the central part of the county along the Tygart Valley River, where the Hiram Anticline exposes the entire Allegheny Series, as well as the lower Conemaugh above, and the upper Pottsville below.

In the following section, arranged in descending order, the upper portion was measuerd with hand-level by the writer up the hill just east of Arden on the Tygart Valley River. The lower portion is the record of a test boring made for coal on the property now owned by the Boat Run Coal Company, and kindly furnished the Survey by Wm. A. Webb, General Manager, of Philadelphia, Pennsylvania. The test was completed August 31, 1906:

Arden Section, Philippi District.

	Thickness. Ft.	In.	Total. Ft.	In.	
Conemaugh Series (82′)					
Sandstone and concealed from top of hill	52	0	52	0	
Sandstone, coarse, partly concealed, Mahoning	30	0	82	0	
Allegheny Series (230′)					
Fire clay, Upper Freeport Coal horizon	....	..	82	0	82′ 0″
Concealed, with sandstone and sandy shale	148	0	230	0	
Black slate and coal blossom, at prospect, Upper Kittanning Coal	....	..	230	0	148′ 0″
Concealed and slate	50	0	280	0	
Coal ....2′ 5½″ Coal, bony......0 7½ Coal, soft, columnar.. 2 9 } Lower Kittanning (1330′ L.) (Boat Run Coal Co. Mine—No. 572 on Map II)	5	10	285	10	55′ 10″
Concealed to coal test	12	2	298	0	
Continued by record of Boat Run Coal Co. Coal Test (19):					
Surface	14	0	312	0	
Pottsville Series (90′ 6″)					
Sand rock, hard, brown ....12′ Sand rock, white, and coal spars......30 } Homewood	42	0	354	0	
Shale, dark	16	0	370	0	
Sand rock and shale	2	0	372	0	
Sand rock	0	6	372	6	
Bone and slate	0	5	372	11	
Coal ....0′ 3″ Slate ......0 3 Coal ....0 7 Bone coal..0 3 Coal ....3 2 Fire clay...2 11 Coal ....0 5 } Upper Mercer	7	10	380	9	94′ 11″
Fire clay	2	0	382	9	
Sand shale	4	8	387	5	
Fire clay	0	7	388	0	
Sand rock and shale	6	0	394	0	
Slate, black	1	6	395	6	
Fire clay	1	0	396	6	
Sand rock, hard, Upper Connoquenessing, to bottom	6	0	402	6	

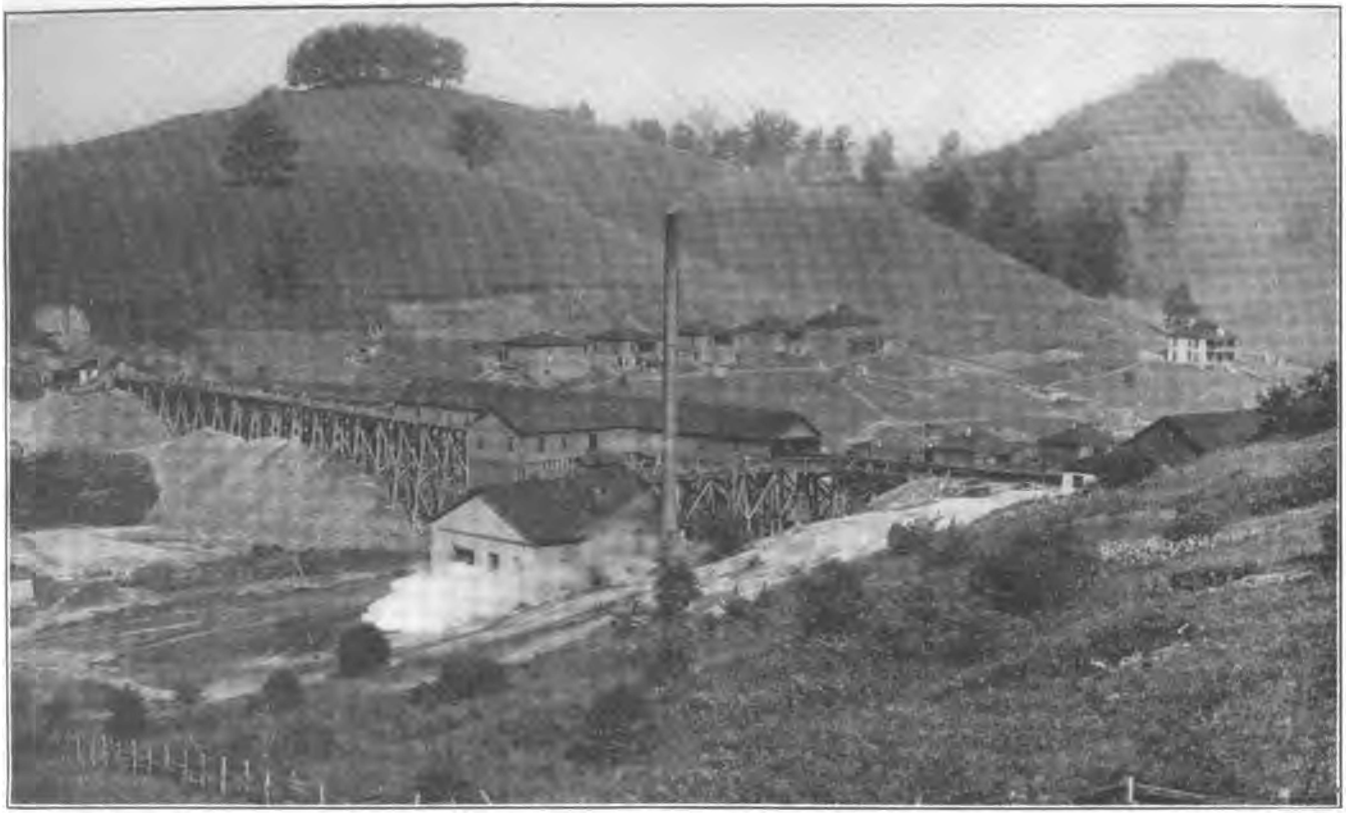

PLATE VI.—Red Rock Fuel Company Mine (No. 67 on Map IV), at Red Rock, Upshur County; Topography of the Monongahela Series.

In the following section, arranged in descending order, the upper portion was measured with hand-level by the writer up the steep river hill just south of Philippi. The lower portion is from the record of the E. D. Talbott Heirs No. 2 (17) Well, drilled by the Tygart Valley Mineral and Oil Company, and located one-half mile west of Philippi. In order to make a continuous stratigraphic sequence, the first 193 feet of the well record are omitted from the section as the eastward rise of the rocks brings the measures shown there above drainage along the river front where the measured part of the section was made. This well starts at the top of the Mahoning Sandstone cliff, which was also identified in the section, leaving no doubt as to the proper connection of the strata at the two points. The record of this well was previously published in Volume I(a), page 344, of the Survey, under the name of "Philippi Well No. 2". Although drilled many years ago, this well still flows a strong stream of brackish sulphur water and makes enough gas to burn with a considerable flame at the mouth of the casing. The section shows a considerable thinning in the Allegheny Series, due to the fact that the measures intervening between the Upper and Lower Kittanning Coals have nearly disappeared, leaving only 29 feet compared to an interval of nearly one hundred feet that is frequently found elsewhere:

Philippi Section, Philippi District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (218′)			
Sandstone, brown, capping ridge, Saltsburg	28	28	28′
Concealed along slope and bench	35	63	
Sandstone, massive, Buffalo	50	113	
Concealed along slope	70	183	
Concealed in bluff, and sandstone, massive, Mahoning	35	218	190′
Allegheny Series (149′)			
Concealed along bench	17	235	
Concealed in bluff and sandstone, massive, Lower Freeport	77	312	
Slate, black (0′ 3″)	...	312	
Coal ....2′ 9½″ Slate, black.0 1 Coal ....1 5½ Slate, bony..1 3 Upper Kittanning (5′ 7″) (1327′ B.) (W. T. Ice Mine No. 489 on Map II).	6	318	100′

	Thickness. Feet.	Total. Feet.	
Shale, sandy, with ferriferous limestone, Johnstown	9	327	
Coal, Middle Kittanning (1' 4")	1	328	10'
Continued in E. D. Talbott Heirs No. 2 (17) Well Record (starting at 193' below top of hole):			
Sand, fine, hard, East Lynn	15	343	
Coal, Lower Kittanning	4	347	19'
Slate rock	20	367	
Pottsville Series (502')			
Sand, hard, close, Homewood, Second Cow Run	45	412	
Coal, Upper Mercer	7	419	72'
Sand, hard, Salt (cased 10" at 301')	30	449	
Slate	40	489	
Sand, hard, Salt	60	549	
Slate	5	554	
Lime, dark	15	569	
Slate	10	579	
Sand, hard, Salt (more water)	25	604	
Slate	5	609	
Lime, very hard	8	617	
Slate	100	717	
Sand, hard, Salt	50	767	
Slate and shell	40	807	
Sand, hard, Salt	20	827	
Lime, hard, (cased, dry, 8" at 700')	18	845	
Slate rock	10	855	
Sand, hard, close, Salt	14	869	450'
Mauch Chunk Series (295')			
Bright red rock	40	909	
Limestone, very hard	5	914	
Red rock	45	959	
Sand, hard	40	999	
Slate, sandy	15	1014	
Sand, hard, dark, Maxton	45	1059	
Shale, red	65	1124	
Shale, black	40	1164	295'
Greenbrier Limestone (92')			
Limestone, hard, Big	92	1256	
Pocono Series (299')			
Sand, gray, hard.........35' Sand, red.........25 Sand, gray, hard.........18 Hard rock......... 7 Lime, black, hard.........25 Sand, close.........25 } **Big Injun**	135	1391	
Shale	30	1421	
Pale red rock	30	1451	
Shale	60	1511	
Sand, white, Berea (fresh water; some oil)	44	1555	391'
Catskill Series (550')			
Sand, hard, Gantz, and limestone	80	1635	
Sand, dark, hard, Fifty-foot (6¼" casing at 1635')	135	1770	

	Thickness. Feet.	Total. Feet.	
Sand, dark-red, and shales	300	2070	
Sand, dark-gray, Fifth	35	2105	550′
Chemung Series (1378′)			
Slate, with limestone shells	705	2810	
Sand, chocolate-colored, Speechley?	50	2860	755′
Shells and shales, no solid formations, to bottom	623	3483	

The following section was measured by the writer with aneroid descending the Tygart Valley River hill just northeast of Tygart Junction, the Upper Mercer Coal and Upper Connoquenessing Sandstone being inserted from exposures at the south end of the railroad bridge at the point between the two rivers:

Tygart Junction Section, Philippi District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (205′)			
Concealed	25	25	
Steep bank, with sandstone, **Buffalo** (1700′ B.)	80	105	105′
Concealed along slope	70	175	
Sandstone, massive, pebbly, cliff rock, **Mahoning**, (1600′ B.)	30	205	100′
Allegheny Series (228′)			
Concealed along bench	20	225	
Concealed in bluff	25	250	
Concealed in slope	115	365	
Sandstone, massive, cliff rock, **East Lynn** (1400′ B.)	40	405	200′
Concealed in slope, with fire clay spring	28	433	
Pottsville Series (52′)			
Sandstone, massive, **Homewood**	35	468	
Coal, slaty, Upper Mercer (2′ 4″), (Exposure No. 839 on Map II) (1335′ L.)	2	470	65′
Fire clay and concealed	5	475	
Sandstone, massive, **Upper Connoquenessing**, to river	10	485	

The following section, arranged in descending order, was measured with aneroid, starting at the public road one-half mile southeast of Adma, and working northwestward to Tygart Valley River at the mouth of the ravine just north of Adma Station. It is near the summit of the Hiram Anticline and shows a considerable portion of the Pottsville:

Adma Section, Philippi District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (80′)			
Concealed from top of hill one-half mile southeast of Adma	10	10	
Fire clay in road	...	10	10′
Concealed	55	65	
Sandstone, massive, cliff rock, Mahoning	15	80	
Allegheny Series (270′)			
Concealed in slope	55	135	
Concealed in steep bluff	60	195	
Spring, with fire clay along bench, Upper Kittanning	...	195	185′
Concealed and sandstone, pebbly	61	256	
Coal, soft, 0″ to...0′ 3″ Slate, gray.......0 5 Coal, bony........0 10 Coal, soft........1 5 Slate, dark-gray..0 1 Coal, soft........1 2 Lower Kittanning (4′ 2″) (1770′ B.) (Mine No. 585 on Map II)	4	260	65′
Sandstone, massive, pebbly, Clarion	47½	307½	
Coal, slaty.......0′ 6″ Coal, medium-soft 3 3 Slate, dark-gray..0 2 Coal, medium-soft 0 9 Slate, gray.......0 2 Coal, medium-soft 2 10 Clarion (7′ 8″) (1715′ B.) (H. M. Crawford & Co. Mine No. 821 on Map II)	7½	315	55′
Concealed	35	350	
Coal blossom	...	350	35′
Pottsville Series (246′)			
Sandstone, massive, cliff, Homewood	20	370	
Concealed	40	410	
Sandstone, massive, pebbly, cliff rock, Upper Connoquenessing	80	490	140′
Slate, black, with Naiadites, Quakertown Shale	1	491	
Concealed and shale	8	499	
Sandstone, massive, makes falls in run, Lower Connoquenessing	30	529	
Coal ....0′ 2″ Slate, black...0 3 Coal ....0 7 Campbell Creek? (1′ 0″) (Exposure No. 914 on Map II).	1	530	40′
Shale, dark, sandy, with iron ore nodules	10	540	
Coal, (0′ 2″), Powellton?	...	540	10′
Slate, dark, with iron ore nodules and plant fossils	24½	564½	
Coal, soft, (1′ 6″), Eagle? (Exposure No. 987 on Map II)	1½	566	26′
Fire clay shale	6	572	
Slate, black, cannelly, with plant fossils	4	576	
Concealed and sandstone to river	20	596	

GENERAL SECTIONS, COVE DISTRICT, BARBOUR.

Cove District occupies the northeastern corner of Barbour, and, being traversed through its center by the deep Belington Syncline, affords a fine opportunity to study the rocks of the Conemaugh Series, all of which are present as is assured by the occurrence of the Pittsburgh Coal in some of the high hills along the axis, and by the rise of the rocks both to the east and west bringing the Allegheny and Pottsville Series to the surface. The Pottsville is all exposed along the Laurel Ridge at the eastern edge of the District, but the rise of the rocks is so rapid and the slopes so much obscured by debris that it was impossible to get a connected section of these formations.

In the following section, arranged in descending order, the upper portion was measured with hand-level by the writer, starting in the valley of Sandy Creek, and working up the hill road southwestward. The Pittsburgh Coal is only a blossom in the hilltop but is mined along the same ridge a short distance southeastward, where its thickness is about 10 feet as shown by the section. The lower portion of the section is the record of the James Lindsay Coal Test (29), located 0.9 mile northwest of Colebank, and previously published on page 253 of the Preston County Report of the Survey. In the surface portion of the section, the intervals are a little greater than true vertical measurement would show as there is a slight southward rise in the rocks:

Colebank Section, Cove District.

	Thickness. Ft.	In.	Total. Ft.	In.	
Monongahela Series (20')					
Concealed from top of hill.........	10	0	10	0	
Coal blossom, Pittsburgh, thickness supplied, (1855' B.)...........	10	0	20	0	20'
Conemaugh Series (633')					
Concealed	30	0	50	0	
Sandstone, coarse, gray, Lower Pittsburgh	45	0	95	0	
Shale, sandy.....................	10	0	105	0	
Spring, Little Pittsburgh Coal horizon	...	..	105	0	85'
Concealed along bench............	25	0	130	0	

	Thickness. Ft.	In.	Total. Ft.	In.	
Sandstone, massive, brown, with small pebbles, Connellsville...	55	0	185	0	
Fire clay and coal blossom, Little Clarksburg Coal...............	2	0	187	0	82'
Concealed	19	6	206	6	
Limestone, shaly, Clarksburg......	0	6	207	0	
Concealed, with reds, Clarksburg..	23	0	230	0	
Sandstone, massive, coarse, brown, mottled with iron, Lower Connellsville	34	0	264	0	
Concealed, with reds, Clarksburg..	38	0	302	0	
Sandstone, brown, partly concealed, Morgantown	25	0	327	0	
Coal, hard..0' 8⅛" Coal, softer ..2 7½ } Elk Lick (Jas. Lindsay Mine) (1545' B.)	3	4	330	4	143'
Concealed	14	8	345	0	
Sandstone, shaly, Grafton.........	24	0	369	0	
Concealed	20	0	389	0	
Limestone, dark, shaly, fossiliferous, Ames..................	4	0	393	0	
Coal, thickness concealed, Harlem (Opening No. 264 on Map II)	....	..	393	0	63'
Concealed and sandstone..........	92	0	485	0	
Coal opening, Bakerstown, fallen shut, (1390' B.), about........	2	0	487	0	94'
Concealed	23	0	510	0	
Continued by James Lindsay Coal Test (29) Record (1365' B.)					
Clay and sand.....................	5	0	515	0	
Boulders and gravel...............	4	0	519	0	
Shale, sandy......................	16	0	535	0	
Shale, gray.......................	11	0	546	0	
Sandstone	4	0	550	0	
Shale, dark.......................	16	0	566	0	
Sandstone	4	0	570	0	
Fire clay, Thornton, and shale, gray, mixed...................	16	0	586	0	
Shale, blue.......................	4	0	590	0	
Shale, soft, gray, with lime spots..	14	0	604	0	
Shale, hard, gray, sandy...........	17	0	621	0	
Sandstone, Lower Mahoning......	11	0	632	0	
Shale, blue.......................	18	0	650	0	
Shale, dark-gray..................	2	10	652	10	
Shale, dark.......................	0	2	653	0	
Allegheny Series (186')					
Bone ...0' 6" Coal ...2 1 } Upper Freeport........	2	7	655	7	169'
Fire clay, Bolivar.................	2	5	658	0	
Sandstone, shaly, Upper Freeport.	20	0	678	0	
Shale, gray.......................	3	0	681	0	
Shale, blue.......................	19	6	700	6	
Shale, dark, Lower Freeport Coal horizon	1	6	702	0	

	Thickness.		Total.		
	Ft.	In.	Ft.	In.	
Fire clay shale	4	0	706	0	
Shale, bluish	5	0	711	0	
Shale, with gray partings	7	0	718	0	
Limestone, Lower Freeport	1	0	719	0	
Shale, gray, with lime spots	21	0	740	0	
Shale, blue	4	6	744	6	
Shale, with limestone	1	0	745	6	
Shale, dark, with thin coal streaks, **Upper Kittanning**	2	6	748	0	92
Sandstone, coarse 4' Sandstone and conglomerate 10 Sandstone 29 } **East Lynn**	43	0	791	0	
Shale, blue, tough	13	0	804	0	
Shale, soft, gray, with hard sandstone boulders	5	0	809	0	
Shale, blue	19	5	828	5	
Coal 0' 5" Binder 0 6 **Coal** 0 3 } **Lower Kittanning**	1	2	829	7	82'
Fire clay nodules	0	5	830	0	
Shale, gray	7	0	837	0	
Shale, gray, with sandstone boulders	2	0	839	0	
Pottsville Series (99')					
Sandstone, hard, broken, with carbon streaks 36' 0" **Bone coal, Clarion** 0 2 Sandstone, hard, with carbon streaks 13 10 Conglomerate 6 0 Sandstone 6 0 Sandstone, fine-grained 16 0 Sandstone, micaceous, with carbon streaks 2 6 } Homewood.	80	6	919	6	
Shale, dark	4	6	924	0	
Shale, dark, tough	4	0	928	0	
Shale, dark, sandy	7	0	935	0	
Shale, sandy, with coal streaks, Upper Mercer	2	0	937	0	107' 5"
Shale, sandy, to bottom	1	0	938	0	

The following section, arranged in descending order, was measured with hand-level by the writer up the steep hill immediately southwest of Danville, where the measures come within a few feet of the Pittsburgh Coal:

Danville Section, Cove District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (415')			
Concealed from top of knob	35	35	
Sandstone, **Lower Pittsburgh**	22	57	
Concealed along slope	33	90	
Concealed in bluff, with coarse, brown sandstone, **Connellsville**	60	150	
Spring, Little Clarksburg Coal horizon	...	150	150'
Concealed along slope, mostly red shale, **Clarksburg**	38	188	
Concealed in bluff, with brown sandstone, **Morgantown**	55	243	
Coal opening, fallen shut, Elk Lick (1649' B.)	...	243	
Concealed	71	314	
Shale, green, fossiliferous, **Ames**, thickness concealed	...	314	
Coal blossom, Harlem (1578' B.)	...	314	71'
Shale, red and variegated, **Pittsburgh**	55	369	
Sandstone, massive, **Saltsburg**	28	397	
Shale, dark	5½	402½	
Coal, (Wellington Shroyer Mine—No. 290 on Map II), (1485' B.) partly fallen shut, **Bakerstown, reported**	4½	407	93'
Concealed to creek	8	415	

In the following section, arranged in descending order, the upper portion was measured with hand-level by the writer, up the hill on the north side of Brushy Fork of Teter Creek, starting one mile northeast of Nestorville. The lower portion is the record of the Lewis Auvill Coal Test (33), drilled by Hon. J. M. Guffey, of Pittsburgh, Pennsylvania, John M. Rayburn, mining engineer, of the same city, being authority for the data:

Nestorville Section, Cove District.

	Thickness.		Total.		
Conemaugh Series (405' 0")	Ft.	In.	Ft.	In.	
Concealed, mostly shale, from top of knob	77	0	77	0	
Sandstone boulders, **Morgantown**	45	0	122	0	
Coal digging, abandoned, Elk Lick (1745' B.)	...	..	122	0	122'
Concealed	20	0	142	0	
Sandstone, hard, brown, **Grafton**	30	0	172	0	
Shale, green, fossiliferous, **Ames**	18	0	190	0	
Coal blossom, Harlem (1677' B.)	...	..	190	0	68'
Shale, red and variegated, **Pittsburgh**	65	0	255	0	

	Thickness.		Total.		
	Ft.	In.	Ft.	In.	
Sandstone, shaly, Saltsburg	17	0	272	0	
Coal digging, abandoned, Bakerstown (1595′ B.)	...	..	272	0	82′
Concealed	33	0	305	0	
Sandstone, massive, pebbly, Buffalo	38	0	343	0	
Slate, dark, Brush Creek (1519′ B.)	5	0	348	0	16′
Concealed	12	0	360	0	
Shale, sandy, and ferriferous	5	0	365	0	
Sandstone, massive, Mahoning	35	0	400	0	
Shale, dark, Uffington	5	0	405	0	
Allegheny Series (255′ 8″)					
Coal ....0′ 10″ Shale, dark, 0″ to.....0 2 Coal ....1 1 } Upper Freeport (Chas. Shaw (1460′ B.) Mine, No. 369 on Map II).	2	1	407	1	59′ 1″
Concealed to top of boring	34	11	442	0	
Continued by Lewis Auvill Coal Test (33) Record (1425′ B.):					
Drift, clay, and boulders	15	0	457	0	
Shells and slate	68	4	525	4	
Sandstone, Lower Freeport	23	0	548	4	
Carbon shale	0	3	548	7	
Shale and sandstone, dark	6	8	555	3	
Coal, Upper Kittanning	1	8	556	11	149′ 10″
Slate, black	2	9	559	8	
Shale	11	3	570	11	
Fire clay	4	2	575	1	
Sandstone ...36′ 9″ Shale, sandy. 0 3 Sandstone ... 6 11 } East Lynn..	43	11	619	0	
Slate	2	10	621	10	
Sandstone, with carbon streaks	3	8	625	6	
Coal, Middle Kittanning	0	10	626	4	69′ 5″
Dark shale or slate, fossiliferous	20	8	647	0	
Coal, clean, Lower Kittanning	2	10	649	10	23′ 6″
Shale, dark	5	11	655	9	
Sandstone and slate	2	0	657	9	
Sandstone	0	8	658	5	
Slate	0	3	658	8	
Sandstone	0	5	659	1	
Slate	0	1	659	2	
Sandstone	0	10	660	0	
Shale	0	3	660	3	
Sandstone	0	3	660	6	
Shale	0	2	660	8	10′ 10″
Pottsville Series (10′ 5″)					
Sandstone ....6′ 5″ Sandstone and slate.0 4 Sandstone ....3 4 Sandstone, very hard, to bottom.......0 4 } Homewood.	10	5	671	1	

The following section, arranged in descending order, was measured with hand-level by the writer up the steep hill just east of the Tygart Valley River one mile southwest of Moatsville. Three short plunger drill tests for coal were once made along this hill but their detailed records could not be secured:

Moatsville Section, Cove District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (290')			
Sandstone massive, brown, pebbly, from top of knob, Grafton	25	25	
Shale, green, fossiliferous, Ames (1790' B.)	10	35	35'
Shale, red and variegated, Pittsburgh	65	100	
Sandstone, Saltsburg, and shale, sandy	30	130	
Coal blossom, Bakerstown, (1685' B.) reported	3	133	98'
Concealed in slope	47	180	
Concealed in bluff	35	215	
Shale, dark with marine fossils (?), Brush Creek	...	215	
Coal blossom, Brush Creek (1600' B.)	...	215	82'
Concealed and shale	30	245	
Sandstone, massive, pebbly, cliff rock, Mahoning	16	261	
Concealed	29	290	
Allegheny Series (200')			
Coal, reported 2' 11" Slate, reported 0 1 Coal, reported, 0' 8" to..1 0 Upper Freeport (4' 0") (Jasper England Mine No. 362 on Map II) (1521' B.)	4	294	79'
Concealed	66	360	
Coal prospect, Lower Freeport, not much found (1455' B.)	...	360	66'
Shale, sandy, and concealed, (prospected for coal but none found)	77	437	
Sandstone, massive, cliff rock, East Lynn	18	455	
Concealed	35	490	
Coal prospect, fallen shut, Lower Kittanning (1325' B.)	...	490	130'
Pottsville Series (140')			
Sandstone, Homewood, and concealed	35	525	
Coal prospect, only black slate found, Upper Mercer	...	525	35'
Concealed and sandstone, massive, Upper Connoquenessing	90	615	
Concealed to Tygart Valley River	15	630	

GENERAL SECTIONS, GLADE DISTRICT, BARBOUR.

Glade District, occupying the eastern central portion of Barbour, is similiar in geologic outcrop to Cove, just north of it, as the Belington Syncline traverses its center in a north and south direction while the Hiram Anticline on the west, and the great uplift on the east, bring the lower measures above drainage.

In the following section, arranged in descending order, the surface portion was measured with hand-level by the writer up a hill road starting at the schoolhouse one-half mile south of Meadowville and continuing to the top of the high hill along the Belington road. The lower portion is the record of the Nelson H. Harris Coal Test (37), drilled by the South Penn Coal Company:

Meadowville Section, Glade District.

	Thickness.		Total.		
Conemaugh Series (582′ 10″)	Ft.	In.	Ft.	In.	
Concealed from top of knob	42	0	42	0	
Sandstone fragments, brown, hard, along slope, **Connellsville**	40	0	82	0	
Fire clay and **coal blossom, Little Clarksburg**, (1984′ B.)	....	..	82	0	82′
Shale, red, **Clarksburg**	70	0	152	0	
Sandstone, massive, brown, **Lower Connellsville**	22	0	174	0	
Shale, red, **Clarksburg**	17	0	191	0	
Sandstone, shaly, **Morgantown**	25	0	216	0	
Shale, sandy	25	0	241	0	
Coal, Elk Lick (1823′ L.)	2	0	243	0	161′
Shale, variegated, partly concealed	58	0	301	0	
Shale, green, fossiliferous, **Ames**, (1755′ L.)	10	0	311	0	68′
Shale, variegated, **Pittsburgh Reds**	38	0	349	0	
Shale, sandy	38	0	387	0	
Coal opening, abandoned, Bakerstown, (1676′ L.), thickness supplied	3	0	390	0	79′
Shale, sandy, with some reds	45	0	435	0	
Sandstone, massive, **Buffalo**	30	0	465	0	
Concealed and shale to boring	30	0	495	0	
Continued by Nelson H. Harris Coal Test Record (37) (1571′ L.):					
Sand and gravel	17	9	512	9	
Shale	13	9	526	6	
Sandstone, **Mahoning**	9	6	536	0	
Shale, **Uffington**	46	10	582	10	

	Thickness. Ft.	In.	Total. Ft.	In.	
Allegheny Series (196' 2")					
Fire clay, Upper Freeport Coal horizon	3	3	586	1	196' 1"
Shale	47	11	634	0	
Coal, Lower Freeport	0	8	634	8	48' 7"
Shale	24	4	659	0	
Limestone. 0' 6" Shale .....8 0 Limestone .1 0 Lower Freeport	9	6	668	6	
Shale	16	0	684	6	
Sandstone, Lower Freeport	10	6	695	0	
Shale	4	7	699	7	
Bone coal..0' 3" Coal ......0 2 Shale, dark, sandy .5 6 Slate, dark 1 0 Bone coal..1 3 Upper Kittanning.... Upper Bench?	8	2	707	9	73' 1"
Shale	5	3	713	0	
Coal ....2' 0" Shale ......1 2 Coal ....0 8 Upper Kittanning, Lower Bench?	3	10	716	10	9' 1"
Shale	40	2	757	0	
Bone coal..1' 0" Coal ....1 3 Middle Kittanning	2	3	759	3	42' 5"
Fire clay	0	6	759	9	
Shale, dark	13	7	773	4	
Slate, black	1	6	774	10	
Coal, Lower Kittanning?	3	0	777	10	18' 7"
Clay shale	1	2	779	0	

In the following section, arranged in descending order. the upper portion was measured with hand-level by the writer, starting at the highway bridge across Sugar Creek, 0.6 mile south of Flora, and going up the hill northeastward. The lower portion is the record of the Isaac Coonts Coal Test (39), drilled by the South Penn Coal Company, and located at the foot of the measured section:

Flora Section, Glade District.

	Thickness. Ft.	In.	Total. Ft.	In.
Conemaugh Series (568')				
Sandstone, brown, pebbly, from top of hill, Lower Pittsburgh	35	0	35	0
Concealed	35	0	70	0
Sandstone, brown, hard, Connellsville	23	0	93	0
Concealed	10	0	103	0

	Thickness.		Total.		
	Ft.	In.	Ft.	In.	
Coal digging, abandoned, not much found, Little Clarksburg (1947' B.)	....	..	103	0	103'
Concealed	82	0	185	0	
Sandstone, brown, flaggy, Morgantown	23	0	208	0	
Concealed, with red shale	77	0	285	0	
Shale, green, fossiliferous, Ames (1765' B.)	10	0	295	0	192'
Shale, variegated, Pittsburgh Reds, and concealed	100	0	395	0	
Coal opening, fallen shut, Bakerstown (1655' B.)	....	..	395	0	100'
Concealed	35	0	430	0	
Sandstone, massive, gray, Buffalo, to level of coal test	45	0	475	0	
Continued by Isaac Coonts Coal Test (39) Record (1575' B.):					
Soil and clay	9	0	484	0	
Shale	10	0	494	0	
Sandstone, Mahoning	74	0	568	0	
Allegheny Series (213' 1")					
Coal, Upper Freeport	3	11	571	11	176' 11"
Shale	3	3	575	2	
Sandstone, Upper Freeport	2	6	577	8	
Shale	52	4	630	0	
Sandstone	6	0	636	0	
Shale	43	0	679	0	
Sandstone, white, Lower Freeport	5	0	684	0	
Shale	20	0	704	0	
Coal, Upper Kittanning	1	5	705	5	133' 6"
Shale	24	4	729	9	
Coal	2	0	731	9	
Shale	16	1	747	10	
Coal, Middle Kittanning	1	6	749	4	43' 11"
Shale	16	10	766	2	
Coal (with thin shale parting) Lower Kittanning	5	11	772	1	22' 9"
Slate, hard	1	0	773	1	
Sandstone	3	0	776	1	
Shale	5	0	781	1	

GENERAL SECTIONS, BARKER DISTRICT, BARBOUR.

Barker District lies in southeastern Barbour, south of Glade, and has the same structural features and much the same surface geology as Cove and Glade except that the southward rise of the rocks along both the Hiram Anticline and the Belington Syncline brings lower formations to the surface.

The following section, arranged in descending order, was measured with hand-level by the writer up the steep hill just north of the Tygart Valley River at Clements where the Hiram Anticline crosses the river:

Clements Section, Barker District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (97')			
Sandstone fragments, from top of hill	2	2	
Concealed	75	77	
Sandstone, massive, **Mahoning**	20	97	97'
Allegheny Series (225')			
Concealed	55	152	
Spring	...	152	
Concealed	33	185	
Spring	...	185	
Concealed	71	256	159'
Sandstone, massive, **Clarion**, concealed, and coal blossom	51½	307½	
Shale, gray	1½	309	
Coal, soft, (1' 0")	1	310	
Shale, gray, sandy	3	313	
Coal, slaty.........0' 10" **Coal**, soft, columnar.3 2 Slate, gray..........0 3 **Coal**, soft, columnar.0 9 Shale, gray, 2' 0" to.0 6 **Coal**, medium-soft...2 11 **Coal**, slightly bony..0 10 **Clarion*** (9' 3") (1752' L.) (H. M. Crawford & Co. Mine, No. 823 on Map II).	9	322	66'

***Note by I. C. White, State Geologist.**—With reference to Mr. Reger's identification of the **Clarion Coal** in the Clements Section, the writer would say that both he and Assistant Ray V. Hennen think that this coal represents the **Lower Kittanning bed** or the same one mined at Lillian, Meriden, Arden, Junior, Harding, and other points along the Tygart Valley River. This latter identification is confirmed not only by the presence of the blossom of the true Clarion Coal in the lower half of the concealed interval of 49 feet below the Crawford mine but also by the presence of the true Upper Kittanning Coal once opened but now fallen shut about 60 feet above the Crawford Mine. Then, too, the character of the coal itself and the parting slates agree with that of the Lower Kittanning as mined along the Valley River and disagree entirely with that of the Clarion Coal once opened and an attempt to mine it made at Lillian, 7½ miles below Clements, where it proved too slaty and bony for commercial use, although it has a thickness there of 6 to 7 feet including partings and occurs only 25 to 30 feet below the **Lower Kittanning Coal** which is opened and mined directly above. The **Clarion Coal** although generally present has not been mined for commercial purposes anywhere in the district except at one point on the Coal and Coke Railway, below Roaring Creek Junction, in Randolph County, and that mine has been abandoned for many years owing to the impurities of slate and bone which rendered the product unmarketable. I. C. W.

	Thickness. Feet.	Total. Feet.	
Pottsville Series (196')			
Concealed	49	371	
Sandstone, massive, pebbly, **Upper Connoquenessing**	63	434	
Slate, black, and concealed	43	477	
Sandstone, massive, **Lower Connoquenessing**	25	502	
Coal, Campbell Creek? (1571' L.)	1	503	181'
Concealed to Tygart Valley River	15	518	

The following section was measured with aneroid by Teets descending the hill road just north of Wilmoth Ford, the abandoned mine of the Valley Coal and Coke Company just south of the Tygart Valley River being inserted at its proper position:

Wilmoth Ford Section, Barker District.

	Thickness. Feet.	Total. Feet.
Conemaugh Series (102')		
Shale, dark	2	2
Sandstone, massive, coarse-grained, **Buffalo**	35	37
Shale, sandy, and concealed	40	77
Bench, concealed	5	82
Sandstone, massive, medium-grained, **Mahoning**	20	102
Allegheny and Pottsville Series (286')		
Shale, sandy, and concealed	47.5	149.5
Slate, black, **Lower Freeport Coal horizon**	0.5	150
Shale, sandy, sandstone, and concealed	90	240
Bench, **Upper Kittanning Coal horizon**	5	245
Shale, sandy, and concealed	63	308
Coal ....0' 8" Slate, gray.0 3 **Coal** ....0 9 **Coal, bony**..0 5 **Coal** ....1 2 **Coal, bony**..0 6 **Coal** ....1 6 Slate, gray.0 4 **Coal, bony**..0 4 **Coal** ....0 8 **Lower Kittanning (6' 7")** (1732' L.) (Valley Coal & Coke Co. Mine, No. 614 on Map II)	7	315
Slate and concealed to top of Valley Coal and Coke Co. Coal Test (62A) at Wilmoth (1659' L.)	73	388

In the following section, arranged in descending order, the surface portion was made with hand-level by the writer up the hill at the northwest edge of Belington, starting at the point where the Buffalo Sandstone makes a prominent cliff along the Baltimore and Ohio Railroad, 0.7 mile northwest of the railroad station. At the top of the hill, the measures have been eroded down to the Connellsville Sandstone, the top of which forms a broad plateau along the ridge that was easily followed northeastward to a point 1.5 miles north of Belington where there is a remnant of the Pittsburgh Coal in two small knobs that rise a little above the general level of the ridge, and this has been inserted at its proper place in the section, using the same thickness as found in the hills about one mile and a half to the northwest where coal is mined. The lower portion of the section is the record of the Blackman Wilmoth No. 3 (70) Coal Test, drilled by the Valley Coal and Coke Company at the head of Grassy Fork, 2.5 miles southwest of Belington, as furnished by the Survey by J. C. Williams, of Ridgeway, Pa., geologist of that company. This boring starts 349 feet higher than the river level at the base of the measured section, but, as shown by the structure contours on Map II, the southward rise of the rocks is practically the same as this interval, making it possible to connect the record directly with the measured section so as to show the stratigraphic sequence complete from the Pittsburgh Coal to the top of the Pottsville:

Belington Section, Barker District.

	Thickness.		Total.		
	Ft.	In.	Ft.	In.	
Monongahela Series (10')					
Coal blossom, in top of hill, Pittsburgh, about	10	0	10	0	10'
Conemaugh Series (567')					
Concealed	45	0	55	0	
Sandstone, massive, brown, pebbly, Connellsville	20	0	75	0	
Shale and concealed	45	0	120	0	
Coal opening, Little Clarksburg, (Alfred Moore Opening—No. 201 on Map II), thickness concealed	...	..	120	0	110'
Sandstone fragments, brown	15	0	135	0	
Concealed	5	0	140	0	
Fire clay, flinty, Clarksburg	6	0	146	0	
Shale, variegated, partly concealed, Clarksburg Reds	56	0	202	0	
Steep bluff, with shaly sandstone, Morgantown	50	0	252	0	

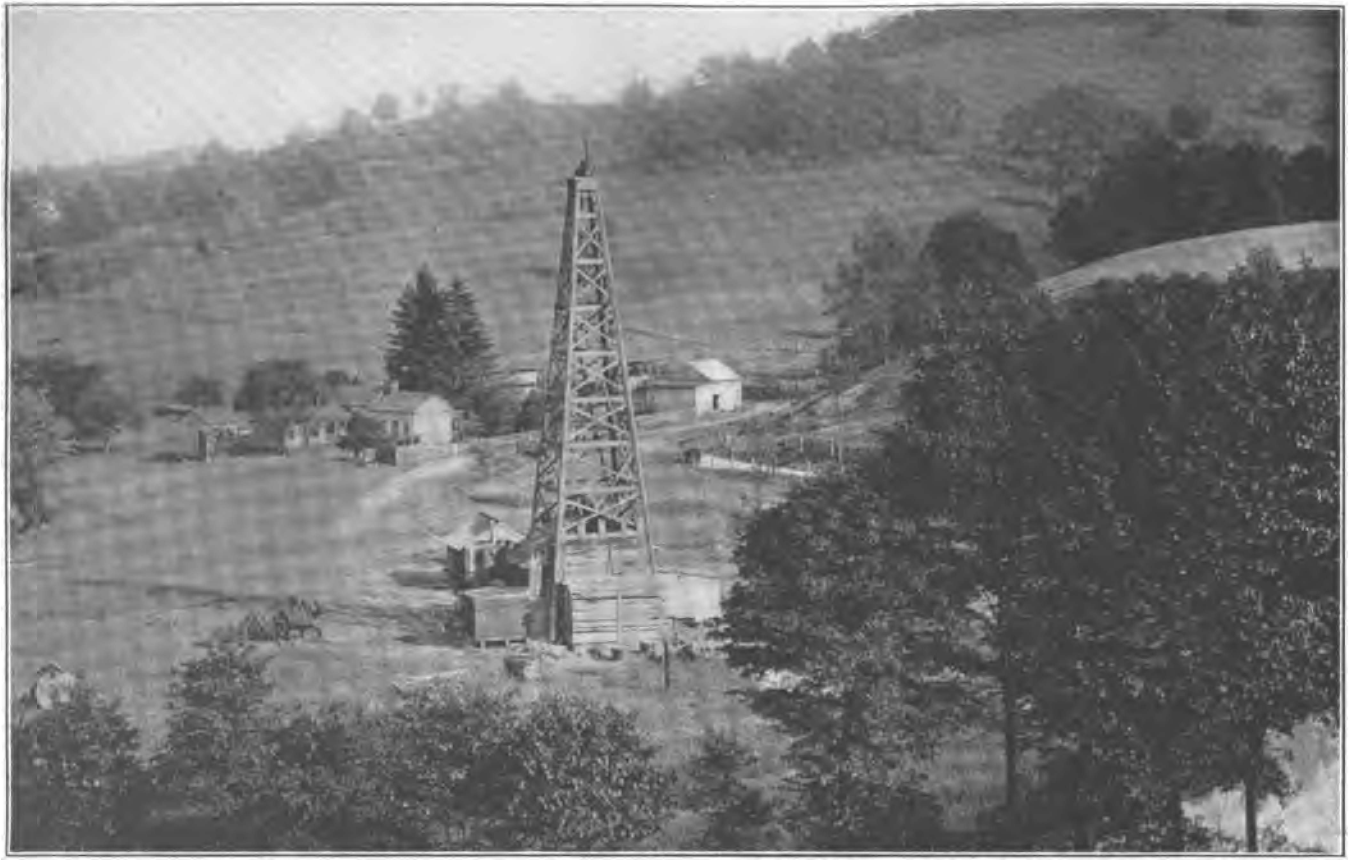

PLATE VII.—J. C. Benson No. 3612 Deep Well (No. 10 on Map II), at Overfield, Barbour County; Topography of the Conemaugh Series, capped by the Monongahela.

	Thickness. Ft.	In.	Total. Ft.	In.	
Fire clay and black slate, Elk Lick Coal horizon	...	..	252	0	132'
Shale, sandy, and variegated, partly concealed	68	0	320	0	
Shale, green, fossiliferous, **Ames**	5	0	325	0	
Coal blossom, Harlem	...	..	325	0	73'
Shale, variegated, **Pittsburgh Reds**	17	0	342	0	
Sandstone, shaly, making cliff, **Jane Lew**	28	0	370	0	
Shale, variegated, **Pittsburgh Reds**	25	0	395	0	
Sandstone, shaly, **Saltsburg**	30	0	425	0	
Coal ....0' 6" Slate, black 0 2 **Coal** ....2 4 } **Bakerstown** (1755' B.) (Albert Rohrbough Mine, No. 312 on Map II).	3	0	428	0	103'
Concealed	10	0	438	0	
Shale, sandy, and variegated	31	0	469	0	
Sandstone, massive, gray, cliff rock, **Buffalo**	30	0	499	0	71'
Flood-plain deposits to Tygart Valley River (1668' B.)	16	0	515	0	
Continued by Blackman Wilmoth No. 3 (70) Coal Test Record (2017' L.):					
Conductor	2	0	517	0	
Sandstone, light-gray, **Upper Mahoning**	18	0	535	0	
Clay shale	28	0	563	0	
Sandstone, gray, **Lower Mahoning**	14	0	577	0	
Allegheny Series (213' 6")					
Clay, **Upper Freeport Coal horizon**	9	8	586	8	87' 8"
Sandstone, gray 20' 4" Clay 8 6 Sandstone, gray 7 0 } **Upper Freeport.**	35	10	622	6	
Shale, argillaceous	43	4	665	10	
Sandstone, soft, gray, **Lower Freeport**	27	10	693	8	
Slate, dark	5	4	699	0	
Coal, Upper Kittanning	6	4	705	4	118' 8"
Shale, argillaceous	7	8	713	0	
Sandstone, hard, gray, **East Lynn**	45	0	758	0	
Coal, Lower Kittanning	6	3	764	3	58' 11"
Fire clay	0	3	764	6	
Sandstone, light, hard, **Clarion**	15	6	780	0	
Clay	3	0	783	0	
Slate, dark-gray	7	6	790	6	
Pottsville Series (3' 6")					
Sandstone, light-gray, flinty, **Homewood**, to bottom of hole	3	6	794	0	

GENERAL SECTIONS, VALLEY DISTRICT, BARBOUR.

Valley District occupies the extreme southeastern corner of Barbour and its surface rocks are principally those of the

Allegheny and Pottsville, although the lower portion of the Conemaugh is present in the hilltops.

The following section, measured by Teets with aneroid, shows the succession descending the hill road northeastward to the Tygart Valley River at O'Brien:

O'Brien Section, Valley District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (45')			
Concealed	25	25	
Sandstone, massive, pebbly, Mahoning	20	45	
Allegheny Series (252')			
Concealed and sandy shale	40	85	
Bench, concealed	10	95	
Shale, sandy, and sandstone, Upper Freeport	40	135	
Bench	5	140	
Sandstone, Lower Freeport, and sandy shale	55	195	
Bench, concealed, Upper Kittanning Coal horizon	5	200	200'
Concealed	50	250	
Bench, concealed	5	255	
Sandstone and concealed	7	262	
Sandstone	2	264	
Slate	2	266	
Coal ....0' 8" Slate, black 0 10 Coal ....0 6 Slate, black.2 1 Coal, soft...2 11 Slate, gray.0 3 Coal ....0 5 Slate, gray.0 5 Coal ....0 11 } Lower Kittanning (1840' B.) (M. N. O'Brien Mine, No. 612 on Map II)	9	275	75'
Shale, sandy, and concealed	19	294	
Coal, Clarion	3	297	22'
Pottsville Series (293')			
Concealed	78	375	
Sandstone, Upper Connoquenessing, and concealed	30	405	
Sandstone, and sandy shale, to river (1525')	185	590	

In the following section, arranged in descending order, the upper portion was measured with aneroid by Teets down a hill one-half mile southwest of the Stonecoal Schoolhouse and 1.2 miles north of Junior. The lower portion is the record of the Cora Wilson (Wm. Boner) No. 1 (69) Coal Test made by the Valley Coal and Coke Company. The junction of the Conemaugh and Allegheny Series is concealed in the 85-foot interval just below the Brush Creek Coal:

Junior Section, Valley District.

Conemaugh and Allegheny Series (370′ 6″)	Thickness. Ft.	In.	Total. Ft.	In.	
Shale, red	15	0	15	0	
Shale, sandy, and concealed	30	0	45	0	
Bench, concealed	5	0	50	0	
Shale, sandy, and concealed	60	0	110	0	
Sandstone, massive, pebbly, **Buffalo**	10	0	120	0	
Concealed	13	0	133	0	
Shale, gray, marine fossils, **Brush Creek**	0	6	133	6	
Coal, Brush Creek	1	6	135	0	135′
Concealed	85	0	220	0	
Sandstone, massive, **Upper Freeport**	15	0	235	0	
Concealed to top of coal test	55	0	290	0	
Continued by Cora Wilson (Wm. Boner) No. 1 (69) Coal Test (1747′ L.):					
Surface	14	10	304	10	
Sandstone, gray	1	6	306	4	
Slate, black	4	2	310	6	
Sandstone, coarse	1	5	311	11	
Fire clay, soft	4	2	316	1	
Sandstone, gray	6	0	322	1	
Fire clay, soft	0	8	322	9	
Sandstone, coarse, gray, **East Lynn**	14	9	337	6	
Slate, argillaceous	15	3	352	9	
Coal, Middle Kittanning	4	0	356	9	241′ 9″
Slate, gray	6	4	363	1	
Coal ...3′ 9″ Parting 0 4 **Coal** ....1 6 Parting 0 8 **Coal** ....1 0 } **Lower Kittanning.**	7	3	370	4	13′ 7″
Fire clay to bottom	0	2	370	6	

The following section was made with aneroid by Teets descending the hill one-third mile northeast of Skidmore, on the west side of the Tygart Valley River:

Skidmore Section, Valley District.

Allegheny Series (205′)	Thickness. Feet.	Total. Feet.
Concealed	75	75
Sandstone, massive, pebbly, **East Lynn**	5	125
Concealed	14	139
Coal blossom, Lower Kittanning	1	140
Concealed	10	150
Sandstone	15	165
Concealed	29	194

	Thickness. Feet.	Total. Feet.
Coal blossom, Clarion	1	195
Concealed	9	204
Coal blossom	1	205
Pottsville Series (165')		
Sandstone, Homewood	20	225
Concealed	40	265
Sandstone and concealed 40' Concealed 20 Sandstone 35 } Upper Connoquenessing	95	360
Concealed to bed of Tygart Valley River (1745' B.)	10	370

UPSHUR COUNTY SECTIONS.

GENERAL SECTIONS, WARREN DISTRICT, UPSHUR.

Warren District occupies the extreme northwestern corner of Upshur, adjoining Lewis and Harrison Counties, and is therefore in the region where the Monongahela Series of rocks is exposed more than any other although the Dunkard is present in the hilltops and the Conemaugh is above drainage along the principal creeks.

In the following section, arranged in descending order, the upper portion was measured with hand-level by the writer, starting at the mouth of a small branch of Hackers Creek 0.8 mile northeast of Bear Knob and working southwestward to the top of the Knob. The lower portion is the record of the Isaac S. Reger No. 1 (41) Well, located one-half mile farther eastward up the creek, and drilled by the Hope Natural Gas Company. The well made a little gas and a showing of oil estimated by the contractor, N. D. Goe, at about five barrels, from what seems to be the Berea Sand, but its distance from other producing territory caused it to be abandoned. The record of this well was previously published by the Survey in the Doddridge-Harrison Report, page 558. Reference to Map IV will show that the strata rise eastward from the base of the measured section toward the well and in connecting the two an allowance of 50 feet was made to cover this interval:

Bear Knob Section, Warren District.

	Thickness. Feet.	Total. Feet.	
Dunkard Series (196′)			
Sandstone, flaggy, from top of Bear Knob	12	12	
Shale, sandy, Washington Coal horizon	10	22	22′
Sandstone, brown, micaceous, Mannington	55	77	
Concealed in slope	55	132	
Sandstone, flaggy, micaceous	10	142	
Concealed, with reds	14	156	
Sandstone, massive, brown, coarse, Waynesburg	40	196	174′
Monongahela Series (358′)			
Concealed	10	206	
Sandstone, green, flaggy, Gilboy	28	234	
Concealed	5	239	
Sandstone, green, hard, Uniontown	35	274	
Coal, Uniontown, (supplied from outcrop at road summit 1.3 miles east)	1	275	79′
Concealed, mostly red shale	47	322	
Sandstone, green, flaggy, Arnoldsburg	10	332	
Concealed and red shale	90	422	
Sandstone, shaly, Upper Sewickley	45	467	
Concealed	45	512	
Coal opening, abandoned, Redstone, thickness supplied	4	516	241′
Concealed	20	536	
Limestone, Redstone, supplied from I. S. Reger spring	2	538	
Concealed	15	553	
Fire clay, Pittsburgh Coal horizon	1	554	38′
Conemaugh Series (571′)			
Concealed and sandstone, Lower Pittsburgh	40	594	
Spring, Little Pittsburgh Coal horizon	...	594	
Concealed	5	599	
Sandstone, Connellsville	27	626	
Concealed, red shale, and concealed	54	680	
Sandstone, Lower Connellsville, to creek	10	690	
Stratigraphic interval to top of well	50	740	
Continued by Isaac Reger No. 1 (41) Well Record (1070′ B.):			
Conductor	14	754	
Unrecorded (water at 80′)	169	923	
Coal, Bakerstown	2	925	371′
Unrecorded	40	965	
Sand 20′ Unrecorded 10 Sand (water) 45 } First Cow Run	75	1040	
Unrecorded	85	1125	
Allegheny Series (273′)			
Coal, Upper Freeport	2	1127	202′
Unrecorded	13	1140	
Sand, Burning Springs	10	1150	
Unrecorded	120	1270	
Sand, Gas	20	1290	
Unrecorded	60	1350	

	Thickness. Feet.	Total. Feet.	
Coal, Lower Kittanning	5	1355	228'
Unrecorded	37	1392	
Coal, Clarion	6	1398	
Pottsville Series (509')			
Unrecorded	35	1433	
Coal, Upper Mercer	4	1437	82'
Unrecorded	83	1520	
Sand, Salt (water) (Connoquenessing)	85	1555	
Unrecorded	49	1604	
Sand, Salt (water)	76	1680	
Unrecorded	100	1780	
Sand, Salt	60	1840	
Unrecorded	5	1845	
Sand, Salt (oil, 1146')	62	1907	
Mauch Chunk Series (310')			
Red rock	246	2153	
Unrecorded	18	2171	
Little Lime	22	2193	
Pencil Cave	24	2217	780'
Greenbrier Limestone (77')			
Big Lime	77	2294	
Pocono Series (302')			
Sand, Big Injun	143	2437	
Unrecorded	89	2526	
Sand, Squaw	14	2540	
Unrecorded	8	2548	331'
Sand, Berea (oil and water, 1834', 5 barrels)	48	2596	
Catskill and Chemung Series (756½')			
Unrecorded	6	2602	
Sand, Gantz	10	2612	
Unrecorded	143	2755	
Red rock, thickness unrecorded	...	2755	
Unrecorded	160	2915	
Sand, Gordon Stray	35	2950	
Unrecorded	10	2960	412
Sand, Gordon	25	2985	
Unrecorded	46	3031	71
Sand, Fourth	12	3043	
Unrecorded to bottom	309½	3352½	
10" casing, 310'; 8" casing, 850'; 6½" casing, 2121'.			

The following section was measured with aneroid by Teets descending the hill road at the head of Big Run of Hackers Creek:

Big Run Section, Warren District.

	Thickness. Feet.	Total. Feet.
Monongahela Series (385')		
Concealed	30	30
Shale, red	10	40

	Thickness. Feet.	Total. Feet.	
Sandstone, Gilboy	10	50	
Shale, sandy, and concealed	20	70	
Shale, red	2	72	
Shale, red, and sandy	18	90	
Sandstone, Uniontown	20	110	110'
Shale, red and sandy, and concealed	55	165	
Fire clay	2	167	
Shale, sandy, and sandstone, Arnoldsburg	28	195	
Shale, red	5	200	
Shale, sandy, and sandstone, Upper Sewickley	60	260	150'
Bench	...	260	
Shale, sandy, and sandstone, Lower Sewickley	45	305	
Shale, red	2	307	
Shale, sandy, and sandstone, Cedarville	37	344	
Coal blossom, Redstone (1340' B.)	1	345	85'
Fire clay	2	347	
Shale, sandy	36	383	
Coal blossom, Pittsburgh (1300' B.)	2	385	40'
Conemaugh Series (85')			
Sandstone, Lower Pittsburgh	15	400	
Shale, red	5	405	
Shale, sandy	20	425	
Sandstone, massive, medium-grained, Connellsville	20	445	
Shale, sandy, and concealed, to run	25	470	

The following section was made with aneroid by Teets descending the steep highway hill at the head of Groundhog Hollow of Hackers Creek, 0.6 mile southwest of Ruraldale, where the southward rise of the rocks makes the recorded intervals a little larger than true vertical measurement would show:

Groundhog Hollow Section, Warren District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (375')			
Sandstone and concealed	30	30	
Sandstone, Uniontown	35	65	65'
Shale, sandy	4	69	
Limestone, nodular, Uniontown	1	70	
Shale, dark-red	30	100	
Shale, sandy, and concealed	50	150	
Sandstone, Upper Sewickley	30	180	
Shale, sandy	10	190	
Sandstone, Lower Sewickley, massive, medium-grained, micaceous	30	220	
Shale, sandy, and concealed	28	248	
Shale, with limestone nodules, Sewickley	2	250	

	Thickness. Feet.	Total. Feet.	
Shale, sandy	15	265	
Sandstone, **Cedarville**	20	285	
Shale, sandy	25	310	
Shale, slaty	5	315	
Coal, Redstone (1410' B.)	5	320	255'
Shale, slaty	5	325	
Shale, sandy, and sandstone ....35' Sandstone ....15' } **Weston**	50	375	55'
Conemaugh Series (175')			
Shale, sandy	12	387	
Shale, red	3	390	
Sandstone, massive, medium-grained, **Lower Pittsburgh**	20	410	
Shale, sandy	10	420	
Shale, red	5	425	
Shale, sandy	5	430	
Sandstone, massive, coarse-grained, gray, **Connellsville**	25	455	
Shale, sandy	8	463	
Fire clay, **Little Clarksburg Coal** horizon (1265' B.)	2	465	90'
Shale, sandy	15	480	
Sandstone, **Lower Connellsville**	25	505	
Shale, red, with limestone nodules, **Clarksburg Reds**	5	510	
Shale, sandy, and sandstone	25	535	
Sandstone, to run, **Morgantown**	15	550	

The following section was measured with aneroid by Teets, descending the hill road one mile southeast of Ruraldale, but the intervals are somewhat larger than true vertical measurement would show as the observations were taken where there is a considerable southward rise:

Ruraldale Section, Warren District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (325')			
Concealed	235	235	
Shale, sandy, and sandstone ....25' Sandstone, flaggy ....10 } **Cedarville**	35	270	
Shale, sandy	15	285	
Coal, Redstone (1415' B.)	5	290	290'
Shale, sandy, and concealed	20	310	
Limestone, **Redstone**	2	312	
Shale, sandy	8	320	
Coal blossom, Pittsburgh (1375' B.)	5	325	35'
Conemaugh Series (220')			
Slate and shale	10	335	

	Thickness. Feet.	Total. Feet.	
Shale, sandy	45	380	
Sandstone, massive, medium-grained	20	400	
Shale, sandy, and sandstone	45	445	
Shale, red	20	465	
Coal blossom and fire clay (1238' B.)	2	467	
Shale, sandy, and sandstone	8	475	
Coal, impure..........0' 4" Shale ....2 8 **Coal, impure**..........0 8 } **Little Clarksburg** (3' 8")	4	479	154'
Fire clay	1	480	
Shale sandy	10	490	
Sandstone, massive, medium-grained, **Lower Connellsville**	20	510	31'
Shale, red, limy, **Clarksburg Reds**	10	520	
Shale, sandy, to Hackers Creek	25	545	

The following section was measured with aneroid by Teets down the steep hill road at the head of the most northern branch of Hackers Creek, 1.3 miles northwest of Pecks Run:

Pecks Run Section, Warren District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (365')			
Concealed	185	185	
Shale, sandy	15	200	
Sandstone, massive cliff, medium-grained, **Lower Sewickley**	60	260	260'
Shale, sandy, and sandstone	35	295	
Sandstone, massive, medium-grained, **Cedarville**	20	315	
Shale, slaty	5	320	
Coal, Redstone (1350' B.) (opening fallen shut, thickness supplied)	5	325	65'
Shale, sandy, and sandstone, **Weston**	23	348	
Limestone, bluish-gray, hard, **Redstone**	4	352	
Shale, slaty	10	362	
Coal blossom, Pittsburgh (1310' B.)	3	365	40'
Conemaugh Series (70')			
Shale, slaty	5	370	
Shale, sandy, and concealed, to run	65	435	

The following section was measured with aneroid by Teets descending the hill road at the head of Right Branch of Gnatty Creek, 1.5 miles southwest of Century, and connects with the W. D. Arnold No. 1 (31) Well, the record of which could not be obtained:

Right Branch of Gnatty Creek Section, Warren District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (280')			
Concealed	60	60	
Shale, sandy, and concealed	20	80	
Sandstone, massive, Arnoldsburg	15	95	
Shale, red, limy	5	100	
Sandstone, massive, Upper Sewickley	15	115	
Shale, sandy	25	140	
Sandstone, massive, Lower Sewickley	20	160	160'
Shale, sandy, and concealed	20	180	
Shale, red, limestone nodules	5	185	
Shale, sandy, and concealed	50	235	
Coal, Redstone (4' 10") (Oda Gum Mine No. 18A on Map IV) (1290' B.)	5	240	80'
Slate and concealed	39	279	
Coal blossom, Pittsburgh (1250' B.)	1	280	40'
Conemaugh Series (105')			
Shale, sandy	10	290	
Sandstone, Lower Pittsburgh	20	310	
Shale, sandy	5	315	
Fire clay, dark, Little Pittsburgh Coal horizon	2	317	37'
Shale, limy	3	320	
Shale, sandy	10	330	
Shale, red	5	335	
Shale, sandy	10	345	
Sandstone, flaggy, Connellsville	15	360	43'
Shale, sandy, and concealed, to top of W. D. Arnold No. 1 (31) Well (1145' B.)	25	385	

The following section was measured with aneroid by Teets starting in the edge of Harrison County and descending the hill road at the head of Charity Fork of Gnatty Creek, 2 miles southwest of Peeltree:

Charity Fork Section, Warren District.

	Thickness. Feet.	Total. Feet.
Monongahela Series (360')		
Concealed	40	40
Shale, dark-red	10	50
Shale, sandy, and concealed	60	110
Shale, red	5	115
Sandstone, massive, Arnoldsburg	30	145
Shale, sandy, and concealed	35	180
Sandstone	10	190
Shale, sandy	25	215
Sandstone, Upper Sewickley	25	240
Shale, sandy, and concealed	35	275
Sandstone 10' Shale, sandy 10 Sandstone 20 } Cedarville	40	315

	Thickness. Feet.	Total. Feet.
Coal, Redstone (1320′ B.)	5	320
Fire clay and slate	5	325
Sandstone, Weston, and sandy shale	30	355
Coal blossom, Pittsburgh (1280′ B.)	5	360
Conemaugh Series (20′)		
Shale, sandy, to run	20	380

In the following section, the upper portion was measured with aneroid by Teets descending what is locally known as the Teets Hill, at the mouth of Threelick Run of Turkey Run, 2.5 miles north of Buckhannon. The lower portion is the record of the Wm. Post No. 1 (42) Well, drilled by the Upshur Oil and Gas Company, the result being a dry hole except for slight shows of gas in some of the Salt Sand members, and a little oil in the Big Lime. The measured section was made where there is a considerable dip in the rocks and the intervals are therefore greater than true vertical measurement would show. The record of the well was furnished the Survey by Floyd G. Smith, of Buckhannon:

Turkey Run Section, Warren District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (50′)			
Concealed	10	10	
Coal, Redstone (1636′ B.)	4	14	14′
Concealed and slate	34	48	
Coal blossom, Pittsburgh (1600′ B.)	2	50	36′
Conemaugh Series (631′)			
Shale, sandy, and concealed	40	90	
Fire clay, Little Pittsburgh Coal horizon	2	92	
Shale, sandy, and concealed	68	160	
Shale, red	5	165	
Shale, sandy	5	170	
Shale, red	2	172	
Shale, sandy, and concealed, to top of well	68	240	
Continued by Wm. Post No. 1 (42) Well Record (1410′ B.):			
Clay	8	248	
Quicksand	5	253	
Slate, blue	12	265	
Lime, gray	20	285	
Slate, white	10	295	
Lime, gray	10	305	
Slate, black	20	325	
Shale, red	20	345	
Slate, white	10	355	
Sand, Grafton	15	370	

	Thickness. Feet.	Total. Feet.	
Slate, white	55	425	
Coal, Harlem or Bakerstown?	1	426	376'
Slate, black	5	431	
Lime, gray (water)	15	446	
Slate, black	15	461	
Lime, white	30	491	
Shale, red	6	497	
Slate, white	9	506	
Sand, Saltsburg (water)	15	521	
Slate, white	20	541	
Sand, Buffalo	35	576	
Slate, white	15	591	
Lime, gray	15	606	
Shale, red	20	626	
Slate, white	10	636	
Sand, Mahoning	45	681	
Allegheny Series (265')			
Slate, black, Upper Freeport Coal horizon	10	691	265'
Lime, gray	15	706	
Sand, Upper Freeport	70	776	
Lime	30	806	
Sand	15	821	
Slate, black, Upper Kittanning Coal horizon	10	831	140'
Lime, black	20	851	
Slate, white	55	906	
Gas Sand	15	921	
Coal and black slate, mixed, Lower Kittanning (gas and water)	15	936	105'
Lime, gray	10	946	
Pottsville Series (584')			
Sand, Homewood, Second Cow Run	50	996	
Slate, black	39	1035	
Coal and slate, with 2' of cannel coal, Upper Mercer	10	1045	109'
Sand, Salt (gas)	118	1163	
Slate	10	1173	
Lime, gray	15	1188	
Slate and shells	120	1308	
Sand, Salt	12	1320	
Slate and shale	75	1395	
Lime	6	1401	
Slate	29	1430	
Lime	20	1450	
Sand, Salt (gas)	8	1458	
Slate	5	1463	
Sand, Salt	17	1480	
Slate	35	1515	
Sand, Salt (cased)	15	1530	
Mauch Chunk Series (225')			
Slate	15	1545	
Shale, red	35	1580	
Lime	20	1600	
Sand, Maxton	30	1630	
Lime	40	1670	
Slate	15	1685	

		Thickness. Feet.	Total. Feet.	
Red rock		40	1725	
Slate, black, and shells		30	1755	710′
Greenbrier Limestone (140′)				
Lime, white..............65′ Lime, black (oil).........50 Lime, white..............25	Big Lime	140	1895	
Pocono Series (285′)				
Sand, black, Keener		20	1915	
Red rock		5	1920	
Sand, white, Big Injun		80	2000	
Lime, white		20	2020	
Slate, black and soft		5	2025	
Sand, white, hard, Squaw		25	2050	
Slate, black, soft		3	2053	
Sand, white, hard, Weir		30	2083	
Slate, black, soft		5	2088	383′
Sand, white, good.........12′ Sand, black, hard.........80	Berea	92	2180	
Catskill Series (557′)				
Slate, black, soft		45	2225	
Red rock		3	2228	
Sand, dark, gray, soft....40′ Sand, white, soft.........17	Fifty-foot	57	2285	
Slate and shells		25	2310	
Sand, gray, hard.........18′ Sand, white, soft.......... 7	Thirty-foot	25	2335	
Slate		10	2345	
Rock, red, and sand, Gordon Stray		107	2452	364′
Sand, gray, hard, Gordon		25	2477	
Slate, black		23	2500	
Sand, gray, Fourth		15	2515	
Red rock and sand, hard		15	2530	
Slate, soft		25	2555	103′
Sand, good..............20′ Sand, brown and red.....50	Fifth	70	2625	
Slate, black		15	2640	
Slate, white, to bottom		97	2737	

GENERAL SECTIONS, BUCKHANNON DISTRICT, UPSHUR.

Buckhannon District lies south of Warren and its surface rocks are principally those of the Monongahela and Conemaugh Series, the outcrop of the latter being the more extensive.

The following section was measured with aneroid by Teets on the east side of the Clarksburg Turnpike, near the head of the northern branch of Fink Run, 1.3 miles north of Buckhannon:

Fink Run Section, Buckhannon District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (100')			
Concealed and slate	55	55	
Coal, Redstone (5' 1") (Alberta Post Mine, No. 60 on Map IV) (1660' B.)	5	60	60'
Concealed	38	98	
Fire clay, dark, (**Pittsburgh Coal horizon**) (1620' B.)	2	100	40'
Conemaugh Series (150')			
Shale, sandy	40	140	
Concealed	18	158	
Fire clay	2	155	
Shale, sandy and concealed	15	170	
Shale, red	5	175	
Sandstone, flaggy, fine-grained	5	180	
Shale, red and sandy	10	190	
Concealed	15	205	
Sandstone, **Connellsville**	5	210	110'
Shale, red and sandy, and concealed	20	230	
Shale, gray, sandy	10	240	
Shale, red, **Clarksburg**	10	250	

In the following section, arranged in descending order, the upper portion was made with hand-level by the writer up a hill just west of Buckhannon and just north of Jawbone Run. The lower portion is the record of the D. D. T. Farnsworth Coal Test Boring (83), drilled in the town of Buckhannon by Jabez Wooley, Floyd G. Smith, of Buckhannon, drill superintendent, being authority for the log. Between the foot of the measured section at the west end of Main Street and the top of the boring, as shown by Map IV, there is a rise in the measures of about 30 feet and this interval is inserted in the section to make the stratigraphic sequence as nearly correct as possible. The top of the section just fails to reach the Pittsburgh Coal which has been eroded from the summit of the hill:

Buckhannon Section, Buckhannon District.

	Thickness. Ft. In.	Total. Ft. In.
Conemaugh Series (609' 10")		
Concealed and shale, sandy, with fragments of iron ore from top of hill	28 0	28 0

	Thickness. Ft.	 In.	Total. Ft.	 In.	
Sandstone ....10' Shale, sandy.. 7 Shale, red....10 Sandstone, shaly ....22 } Lower Pittsburgh Sandstone	49	0	77	0	
Shale, red and sandy.............	38	0	115	0	
Fire clay, streak.................	....	..	115	0	
Sandstone, massive, quarry rock, Connellsville	15	0	130	0	130'
Limestone, siliceous, Clarksburg..	0	6	130	6	
Shale, sandy and red.............	21	6	152	0	
Sandstone, shaly, Lower Connellsville	12	0	164	0	
Shale, red........................	42	0	206	0	
Limestone, brecciated............	2	0	208	0	
Shale, red........................	44	0	252	0	
Sandstone, shaly, Morgantown.....	11	0	263	0	133'
Shale, red........................	15	0	278	0	
Shale, sandy, partly concealed....	42	0	320	0	
Stratigraphic interval to top of boring	30	0	350	0	
Continued by D. D. T. Farnsworth Coal Test Record (83) (1420' B.):					
Surface	20	0	370	0	
Shale, blue......................	5	0	375	0	
Coal	0	1	375	1	
Sandstone 43' 0" Sandstone, red ... 5 0 } Saltsburg......	48	0	423	1	160' 1"
Shale, red.......................	6	3	429	4	
Shale, red.......................	0	3	429	4	
Sandstone	35	9	465	1	
Limestone, Pine Creek...........	1	0	466	4	
Sandstone, red.....12' 9" Sandstone, blue....18 0 } Buffalo	30	9	497	1	
Fire clay, blue..................	2	0	499	1	
Limestone, gray..................	2	0	501	1	
Sandstone, blue..................	12	6	513	7	
Black slate and coal, Brush Creek	3	6	517	1	94' 0"
Slate	5	0	522	1	
Sandstone, blue..................	0	5	522	6	
Slate, black.....................	16	1	538	7	
Shale, red.......................	18	0	556	7	
Shale, blue......................	12	0	568	7	
Slate, black.....................	9	0	577	7	
Coal, Mahoning..................	1	2	578	9	61' 8"
Limestone, Mahoning.............	0	1	578	10	
Sandstone, blue.19' 0" Whetstone grit.. 9 0 Sandstone, blue. 3 0 } Mahoning	31	0	609	10	
Allegheny Series (189' 9")					
Slate and coal, Upper Freeport....	3	6	613	4	34' 7"

	Thickness.		Total.		
	Ft.	In.	Ft.	In.	
Limestone ....1' 6" Sandstone, blue......4 0 Limestone 4 0	9	6	622	10	
Sandstone, blue, Upper Freeport...	48	0	670	10	
Shale, blue......................	18	0	688	10	
Slate, black......................	33	3	722	1	
Coal, Upper Kittanning...........	3	6	725	7	112' 3"
Slate, black......................	68	0	793	7	
Iron ore to bottom...............	6	0	799	7	

In the following section, arranged in descending order, the surface portion was made with hand-level by the writer up the hill east of Lick Run of Cutright Run, 1.5 miles northeast of Rocky Ford, and connects at the base with the Simon J. Strader No. 1 (84) Coal Test, drilled by A. D. Simon, of Fairmont, W. Va., who furnished its record to the Survey. This record is used as the lower portion of the section, but unfortunately extends downward only 5 feet below the Brush Creek Coal and therefore failed to reach the Upper Freeport, or Adrian Coal, which should be found at about 50 feet below the bottom of the hole as its interval below the Brush Creek in this locality is much less than usual, as was proved by observations farther down Cutright Run where both coals crop. The driller evidently did not allow for the rapid western dip of the rocks along Cutright Run, and therefore failed to get the information desired in the Strader test:

Cutright Run Section, Buckhannon District.

	Thickness.		Total.		
Conemaugh Series (440' 2")	Ft.	In.	Ft.	In.	
Sandstone, shaly, from top of knob, Connellsville	50	0	50	0	
Concealed, with reds, Clarksburg..	50	0	100	0	
Sandstone, partly concealed, Lower Connellsville	20	0	120	0	
Spring	...	..	120	0	
Concealed	33	0	153	0	
Sandstone, massive, brown, Morgantown	16	0	169	0	169'
Concealed to boring..............	71	0	240	0	
Continued by Simon J. Strader No. 1 (84) Coal Test Record (1455' B.):					
Surface	30	0	270	0	
Fire clay........................	2	0	272	0	

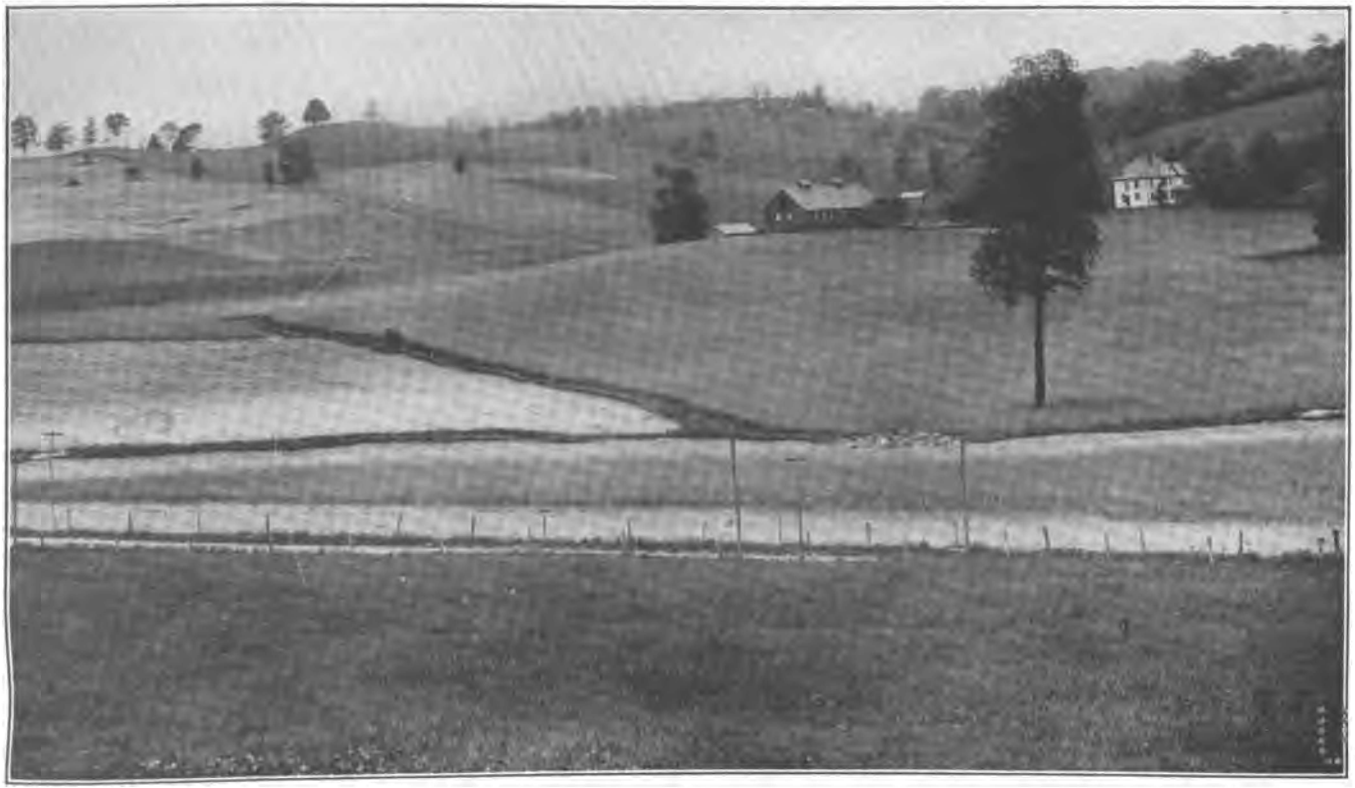

PLATE VIII.—Model farm of W. D. Zinn, just west of Philippi, Barbour County, showing piles of limestone fertilizer; Topography of the Conemaugh Series.

	Thickness.		Total.		
	Ft.	In.	Ft.	In.	
Shale, blue	14	0	286	0	
Fire clay	3	0	289	0	
Sand rock, Saltsburg	25	0	314	0	
Soapstone and fire clay	9	0	323	0	
Coal, Bakerstown	0	2	323	2	154′ 2″
Fire clay	8	0	331	2	
Sand rock	0	10	332	0	
Soapstone	10	0	342	0	
Fire clay	10	0	352	0	
Shale, light	20	0	372	0	
Fire clay	7	0	379	0	
Shale, blue	10	0	389	0	
Soapstone and slate	46	0	435	0	
Coal, Brush Creek	0	2	435	2	112′
Fire clay	5	0	440	2	

GENERAL SECTIONS, UNION DISTRICT, UPSHUR.

Union lies east of Buckhannon District and next to Barbour and Randolph Counties, and is in the region where the Allegheny and Pottsville rocks come to the surface, the Conemaugh being represented in the northwestern portion. The lack of deep creek valleys such as characterize the region northwest of Buckhannon, and the rapidly rising structure made it impossible to secure as good sections as were desired.

The following section was measured with aneroid by Teets descending the hill road immediately to the northwest of Hinkle, on Sand Run, where the rapid rise of the rocks causes the intervals as recorded to be somewhat shorter than true vertical measurement would show:

Hinkle Section, Union District.

	Thickness.	Total.	
Conemaugh and Allegheny Series (365′)	Feet.	Feet.	
Shale, red	10	10	
Shale, sandy	20	30	
Sandstone, massive, coarse-grained, Saltsburg	23	53	
Coal blossom, Bakerstown (1735′ B.)	2	55	55′
Shale, sandy and concealed	15	70	
Sandstone, Buffalo	20	90	
Shale, sandy and concealed	10	100	
Shale, pinkish	0.5	100.5	
Shale, black cannel (with Brush Creek marine fossils)	1.5	102	47′
Shale, sandy	2	105	

	Thickness. Feet.	Total. Feet.	
Sandstone, massive, brown, hard, pebbly, Upper Mahoning	35	140	
Shale, sandy and concealed	85	225	
Shale, sandy, with iron ore concretions	5	230	
Shale, sandy and concealed	40	270	
Bench	0	270	
Shale, sandy, and concealed	62	332	
Coal blossom, Lower Kittanning (1455' B.)	3	335	233'
Shale, sandy, and concealed to Sand Run	30	365	

The following section was made with aneroid by Teets descending a hill road to Sand Run, 1.7 miles east of Reger. The intervals are less than true vertical measurement would show as the observations were taken on the rise:

Reger Section, Union District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (98')			
Sandstone, Buffalo	20.5	20.5	
Shale, dark, with marine fossils, Brush Creek	0.5	21	
Shale, dark	1.5	22.5	
Coal blossom, Brush Creek (1712' B.)	0.5	23	23'
Shale, iron ore nodules, and concealed	57	80	
Sandstone, Mahoning, and concealed	18	98	
Allegheny Series (142')			
Coal blossom, Upper Freeport (1635' B.)	2	100	77'
Sandstone, Upper Freeport	20	120	
Shale, sandy and concealed	18	138	
Fire clay, Lower Freeport Coal horizon	2	140	40'
Sandstone, massive, medium-grained, Lower Freeport	35	175	
Shale, sandy and concealed	35	210	
Sandstone, Lower Freeport	10	220	
Shale, slaty	0.5	220.5	
Coal, blocky.0' 10" Slate, gray...0 1 Coal ....1 7 (2' 6") Upper Kittanning (1512' L.) (Martin Dolan Mine No. 524 on Map IV).	2.5	223	83'
Slate and concealed to Sand Run	17	240	

The following section was made with aneroid by Teets descending a hill road to Left Fork of Sand Run, 2 miles southeast of Overhill. The intervals are greater than true vertical measurement would show as the observations were taken on the dip:

Overhill Section, Union District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (10′)			
Shale, sandy and concealed	10	10	
Allegheny Series (295′)			
Fire clay, Upper Freeport Coal horizon (2065′ B.)	5	15	15′
Sandstone, flaggy, **Upper Freeport**	30	45	
Shale, sandy	10	55	
Sandstone, flaggy	20	75	
Shale, sandy and concealed	58	133	
Coal blossom, Upper Kittanning (1945′ B.)	2	135	120′
Shale, sandy, and concealed	86	221	
Coal blossom, Middle Kittanning (1855′ B.)	4	225	90′
Shale, sandy and concealed	15	240	
Coal blossom, Lower Kittanning (1835′ B.)	5	245	20′
Shale, sandy and concealed	19	264	
Slate, black, very hard, with plant fossils	1	265	
Shale, sandy, and sandstone, **Clarion**	40	305	60′
Pottsville Series (85′)			
Sandstone, pebbly, **Homewood**	45	350	
Shale, sandy and concealed	5	355	
Sandstone, massive, pebbly, **Upper Connoquenessing**, to bottom	35	390	

The following section was measured with aneroid by Teets, starting at the top of a hill 0.5 mile northwest of Swamp Run and descending northwestward to a small branch of Middle Fork River, the intervals being too large, owing to the dip:

Swamp Run Section, Union District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (195′)			
Concealed	27	27	
Coal, Upper Kittanning (1920′ B.) (opening fallen shut), reported	3	30	30′
Shale, sandy, sandstone and concealed	35	65	
Sandstone, massive, medium-grained, **East Lynn**	30	95	
Shale, sandy and sandstone	50	145	
Coal, blossom, Lower Kittanning (1800′ B.)	5	150	120′
Sandstone, massive, pebbly, **Clarion**	40	190	
Shale	5	195	45′
Pottsville Series (30′)			
Sandstone, **Homewood**, to bottom	30	225	

The following section was measured with aneroid by Teets, descending from a hilltop northwestward to Yokum on the Middle Fork River, the observations being taken on the strike and representing true vertical measurement:

Yokum Section, Union District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (110')			
Sandstone, massive, pebbly, **Lower Freeport**	20	20	
Concealed	45	65	
Bench, concealed	5	70	
Sandstone, **East Lynn**	10	80	
Shale, black, slaty, Lower Kittanning Coal horizon (2088' B.)	2	82	82'
Concealed	28	110	
Pottsville Series (260')			
Sandstone, **Homewood**	35	145	
Concealed	50	195	
Bench	5	200	
Concealed	95	295	
Bench, **Quakertown Coal horizon**	5	300	218'
Concealed to Middle Fork River (1800' B.)	70	370	

The following section was measured with aneroid by Teets, starting at the top of the ridge 1 mile northeast of Lantz, and descending northward to the Middle Fork River, one-third mile below the mouth of Devil Run, the intervals representing true vertical measurement along the strike:

Lantz Section, Union District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (115')			
Concealed	50	50	
Sandstone, massive, **East Lynn**	31	81	
Coal, soft..2' 1" **Coal, bony**..0 8 **Coal, soft**...1 3 } (4' 0") **Lower Kittanning** (2110' B.) (D. C. Dunnington Mine, No. 659A on Map IV).	4	85	85'
Concealed and sandstone, **Clarion**	30	115	
Coal, Clarion (opening fallen shut, thickness concealed)	...	115	30'
Pottsville Series (295')			
Shale, sandy and concealed	109	224	
Coal blossom, Lower Mercer	1	225	110'
Shale, sandy, and concealed	75	300	
Concealed	40	340	
Coal, Pickens "A" (prospect, fallen shut, thickness concealed)	...	340	115'
Concealed to Middle Fork River (1790' B.)	70	410	

GENERAL SECTIONS, MEADE DISTRICT, UPSHUR.

Meade District occupies the central western portion of the county, just south of Buckhannon and west of Washing ton District, its surface rocks ranging from the Conemaugh, through the Allegheny and well down into the Pottsville Series. In the western part the hills are low, making it impossible to get long sections but along the Buckhannon River at the east there is better opportunity for surface measurement of intervals.

The following section was measured with aneroid by the writer descending the hill road just south of French Creek village, between the two branches of Brush Run. Owing to the northward dip of the measures the intervals are greater than true vertical measurement would show:

French Creek Section, Meade District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (88')			
Sandstone boulders, **Buffalo**	5	5	
Slate, sandy	10	15	
Coal blossom, Brush Creek	...	15	15'
Concealed, mostly sandy shale	30	45	
Fire clay	1	46	
Concealed, with sandstone, **Mahoning**	42	88	
Allegheny Series (172')			
Coal opening, Upper Freeport (1605' B.) (Richard P. Young Mine No. 439 on Map IV) reported	2	90	75
Fire clay, **Bolivar**	25	115	
Shale, sandy	20	135	
Sandstone, massive, pebbly, cliff rock, **Upper Freeport**	50	185	
Shale, sandy	30	215	
Sandstone, shaly, **Lower Freeport**	15	230	
Shale, sandy	10	240	
Coal, Upper Kittanning	1	241	151'
Fire clay, **Upper Kittanning**	2	243	
Concealed	7	250	
Sandstone, massive, to Brush Run, **East Lynn**	10	260	

The following section was measured with aneroid by the writer descending a hill road northeastward along the strike of the rocks to Laurel Fork of French Creek, 1.5 miles northwest of Evergreen:

Evergreen Section, Meade District.

	Thickness. Feet.	Total. Feet.
Conemaugh Series (185')		
Sandstone, boulders and concealed	35	35

	Thickness. Feet.	Total. Feet.	
Shale, dark, Brush Creek	5	40	
Coal blossom, Brush Creek	...	40	40′
Concealed	30	70	
Sandstone, coarse	25	95	
Shale, sandy	10	105	
Bench	...	105	
Fire clay, Thornton	15	120	
Sandstone, massive, pebbly, Lower Mahoning	65	185	
Allegheny Series (186′)			
Concealed, Upper Freeport Coal horizon	10	195	155′
Sandstone, shaly, Upper Freeport	30	225	
Shale, sandy, partly concealed	65	290	
Sandstone, massive, East Lynn	45	335	
Slate, bony	1	336	
Coal, soft....0′ 6″ Coal, harder..1 8 Coal, bony...0 10 Coal, medium-hard ....2 3 (5′ 3″) Middle Kittanning (1457′ L.) (John Perry Mine, No. 666 on Map IV)	5	341	
Shale, gray	4	345	
Coal, medium-hard .....2′ 6″ Coal, bony.....1 0 Coal, medium-hard .....2 1 (5′ 7″) Lower Kittanning (1447′ L.) (John Perry Mine No. 666 on Map IV).	6	351	156′
Concealed to Laurel Fork	20	371	

In the following section arranged in descending order, the surface portion was made with hand-level up the hill road immediately southwest of Sago, a few of the exposures being found at the east portal of the Coal and Coke Railway tunnel. Measurements were made along the strike of the rocks, assuring true vertical intervals. The lower portion is the record of the George Burner No. 1 (58) Well, drilled by the Citizens Natural Gas Company near the railroad station, and previously published in Volume I(a), page 351, of the Survey. The well was abandoned as a dry hole, having made only a show of gas in the Fourth Sand:

Sago Section, Meade District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (66′)			
Concealed, with sandstone, Mahoning, from top of knob	66	66	
Allegheny Series (195′)			
Coal blossom, Upper Freeport, thickness supplied (1631′ L.)	5	71	71′
Fire clay, Bolivar	10	81	

	Thickness. Feet.	Total. Feet.	
Concealed	14	95	
Sandstone, massive, coarse, **Upper Freeport**	63	158	
Limestone, ferriferous	1	159	
Shale, dark, sandy	15	174	
Coal ....0' 2" Shale, gray ...1 0 **Coal**, bony ..1 6 (2' 8") **Upper Kittanning** (1525' B.) (Exposure No. 531 on Map IV)	2.5	176.5	105.5'
Limestone, hard (0' 6"), **Johnstown**	0.5	177	
Shale, limy	3	180	
Sandstone, shaly	6	186	
Coal (0' 6")	0.5	186.5	
Shale, dark	3.5	190	
Shale, sandy, and thin sandstones	68	258	
Coal blossom, Lower Kittanning (thickness supplied)	3	261	84.5'
Pottsville Series (817')			
Concealed to top of well	17	278	
Continued by George Burner No. 1 (58) Well Record (1432' L.):			
Soil	16	294	
Lime, white	6	300	
Slate or shale, black	15	315	
Lime, white	4	319	
Coal and slate, Upper Mercer	9	328	67'
Lime, white	50	378	
Sand, white, Salt	17	395	
Lime, brown	4	399	
Sand and lime, white and hard	69	468	
Slate, black	17	485	
Slate and sand, black	37	522	
Lime, white	11	533	
Slate, black, hard	116	649	
Sand, white, fine, Salt	20	669	
Lime, white	9	678	
Sand, white, fine and hard, Salt	76	754	
Slate, black	111	865	
Lime, brown and hard	110	975	
Slate, black	15	990	
Coal and slate, Sewell	4	994	666
Slate, black	10	1004	
Sand, white, Salt	74	1078	
Mauch Chunk Series (298')			
Red shale, light	40	1118	
Lime, white and hard	84	1202	
Sand, white and hard, Maxton	31	1233	
Shale, red	68	1301	
Slate, black, hard	8	1309	
Lime, white	15	1324	
Shale, black, hard	8	1332	
Lime, whitish, Little Lime	24	1356	
Shale, red	20	1376	382'
Greenbrier Limestone (92')			
Big Lime, white, hard	92	1468	

	Thickness. Feet.	Total. Feet.	
Pocono Series (320′)			
Sand, white, hard....... 22′ Sand, red, light......... 12 Sand, white............126 } **Big Injun**....	170	1638	
Slate, black, sandy........................	14	1652	
Sand, white, Squaw........................	36	1688	
Slate, light................................	20	1708	
Sand, white, Berea.........................	80	1788	412′
Catskill Series (515′)			
Lime, white................................	10	1798	
Red rock...................................	164	1962	
Sand, Thirty-foot...........................	19	1981	
Red rock...................................	41	2022	
Slate	26	2048	
Sand and shale, (water), Gordon Stray......	25	2073	
Red rock...................................	30	2103	
Sand, Gordon...............................	9	2112	324
Slate, black...............................	32	2144	
Lime, white................................	12	2156	
Slate	6	2162	
Lime, white................................	16	2178	
Slate	27	2205	
Sand, light, Fourth (little gas)............	6	2211	
Slate	7	2218	
Slate, sandy, light.........................	25	2243	
Slate	15	2258	
Sand, Fifth................................	20	2278	166
Slate, black, to bottom (steel-line measure)	25	2303	

The following section, arranged in descending order, was measured with hand-level by the writer at the plant of the Imperial Sand Company, which operates a sand quarry and mine at Imperial, on the west side of the Buckhannon River:

Imperial Section, Meade District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (216′)			
Concealed, mostly sandy shale, from top of hill	40	40	
Sandstone, partly concealed................	33	73	
Concealed in slope.........................	29	102	
Shale, dark, Upper Kittanning Coal horizon..	...	102	102′
Fire clay, Upper Kittanning................	3	105	
Sandstone, shaly......... 5′ Sandstone, massive, quarry rock ....40 } East Lynn...	45	150	
Concealed, with slate and sandstone, East Lynn	55	205	

	Thickness. Feet.	Total. Feet.	
Coal, medium-hard to soft ......3' 3" Slate, black...0 2 Coal, soft.....0 6 Coal, bony.....1 3 Coal, hard.....0 6 (5' 8") Lower Kittanning (1883' B.) (Imperial Sand Co. Mine, No. 687 on Map IV)	6	211	109'
Concealed, with fire clay shale, Lower Kittanning	5	216	
Pottsville Series (138')			
Sandstone, massive, upper portion of Homewood	38	254	
Concealed to Buckhannon River	100	354	

The following section was measured with aneroid by Teets, descending the hill road immediately west of Beans Mill:

Beans Mill Section, Meade District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (70')			
Sandstone, massive cliff, East Lynn	30	30	
Shale, sandy and concealed	10	40	
Coal, Lower Kittanning (1970' B.) (opening fallen shut) reported	5	45	45'
Shale, sandy and concealed	15	60	
Fire clay	10	70	
Pottsville Series (175')			
Sandstone, Homewood	35	105	
Shale, sandy	15	120	
Sandstone	20	140	
Shale, sandy and concealed	62	202	
Fire clay	3	205	
Shale, sandy, and sandstone, Upper Connoquenessing, to Buckhannon River, (1770' B.)	40	245	200'

The following section was measured with aneroid descending the hill road immediately northwest of Alexander, the Jesse Pringle coal mine which is located about one-half mile farther northwest being inserted at its proper place above the Homewood Sandstone:

Alexander Section, Meade District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (100')			
Concealed from top of knob	80	80	
Coal opening, fallen shut, thickness concealed, Middle Kittanning	...	80	80'

	Thickness. Feet.	Total. Feet.	
Slate, dark	2	82	
Coal, bony ..0' 10" **Coal,** soft ...3 3 (4' 1") **Lower Kittanning** (2070' B.) (Jesse Pringle Mine, No. 694 on Map IV)	4	86	6'
Concealed	14	100	
Pottsville Series (270')			
Sandstone, massive, pebbly, **Homewood**	65	165	
Concealed	25	190	
Coal digging, abandoned, not much found, Upper Mercer	...	190	104'
Sandstone, massive, **Upper Connoquenessing**	40	230	
Concealed	25	255	
Coal blossom, streak, Quakertown	...	255	65'
Shale, sandy, thin sandstones and concealed, to Buckhannon River	115	370	

GENERAL SECTIONS, WASHINGTON DISTRICT, UPSHUR.

Washington District lies in the southeastern corner of Upshur next to Randolph, and being in the region where the structure is rising rapidly eastward, its surface rocks are principally those of the Allegheny and Pottsville Series.

The following section, arranged in descending order, was measured with hand-level up the steep hill just northeast of Tenmile on the Buckhannon River:

Tenmile Section, Washington District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (28')			
Sandstone, massive, from top of knob, **Mahoning**	28	28	
Allegheny Series (225')			
Bench, Upper Freeport Coal horizon (1917' L.)	...	28	28'
Concealed and sandstone, in steep bluff, **Upper Freeport Sandstone**	56	84	
Coal digging, not much found, Lower Freeport (1861' L.)	...	84	56'
Concealed in bench	5	89	
Concealed in steep bluff	55	144	
Coal opening, abandoned, Upper Kittanning (1801' L.)	...	144	60'
Concealed	23	167	
Sandstone, massive, partly concealed in steep bluff, **East Lynn**	60	227	
Concealed	15	242	
Slate, black	2	244	

	Thickness. Feet.	Total. Feet.	
Coal, good ..1' 0" **Coal,** bony ..0 7 **Coal,** soft ....2 0 } (3' 7") **Lower Kittanning** (1697' L.) Alfred Debarr Mine (No. 715 on Map IV)	4	248	104'
Fire clay and concealed....................	5	253	
Pottsville Series (84')			
Sandstone, massive, **Homewood**............	50	303	
Concealed to river.........................	34	337	

In the following section, arranged in descending order, the upper portion was measured with hand-level by Teets westward up the private road just west of Stockerts on Panther Fork of Buckhannon River and connects at the base with the Isherwood and Cody No. 1 (59A) Well, drilled for oil by the same firm, the record of which, furnished the Survey by R. B. Cody, of Elkins, W. Va., makes the lower part of the section:

Stockerts Section, Washington District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (55')			
Concealed	30	30	
Slate, dark................................	4	34	
Coal, bony....0' 4" **Coal,** soft......2 0 **Coal,** bony....0 9 Slate, gray.....0 9 **Coal,** soft......2 0 } (5' 7") **Lower Kittanning** (Jacob Queen Mine, No. 737 on Map IV)	6	40	40'
Slate and concealed.......................	15	55	
Pottsville Series (573')			
Sandstone, massive, pebbly, gray, (**Homewood**)	30	85	
Shale, sandy and concealed to bench........	150	235	
Concealed to top of Isherwood & Cody No. 1 (59A) Well at Stockerts (2117' B.).....	53	288	
Continued by Isherwood & Cody No. 1 (59A) Well Record (2117' B.):			
Unrecorded	47	335	
Slate (10" casing, 47')...................	83	418	
Sand	15	433	
Coal, Eagle?..............................	2	435	395'
Sand	13	448	
Slate	15	463	
Lime	47	510	
Slate	93	603	
Sand, hard.................................	25	628	
Mauch Chunk Series (650')			
Lime	50	678	243'
Red rock...................................	15	693	
Lime	35	728	

		Thickness. Feet.	Total. Feet.	
Sand, white		30	758	
Slate, black		15	773	
Sand		165	938	
Red rock		90	1028	
Sand, Maxton (some oil)		100	1128	450′
Red rock		70	1198	
Lime		10	1208	
Red rock		70	1278	150′
Greenbrier Limestone (282′)				
Lime 30′	Big Lime	282	1560	
Sand 25				
Lime 153				
Red rock 2				
Lime 72				
Pocono Series (178′)				
Sand white, Big Injun		26	1586	
Red rock		17	1603	
Sand, Big Injun		25	1628	
Slate		10	1638	
Red rock		5	1643	
Slate		30	1673	
Sand, Squaw		10	1683	
Red rock		2	1685	407′
Sand, Weir (oil show)		30	1715	
Unrecorded to bottom		23	1738	

The following section, arranged in descending order, was measured with hand-level by Teets and the writer, starting at the west portal of the Coal and Coke Railway tunnel at Sand Run Station and working northward to the top of the hill, and shows in great detail the Kittanning and Clarion stage at that locality:

Sand Run Section, Washington District.

		Thickness. Feet.	Total. Feet.	
Allegheny Series (177′)				
Concealed from top of knob		55	55	
Shale, sandy		11	66	
Slate, black		1	67	
Sandstone, shaly		3	70	
Shale		3.5	73.5	
Coal, Upper Kittanning (0′ 6″)		0.5	74	74′
Sandstone, massive, quarry rock 25′	East Lynn	48	122	
Sandstone, partly concealed 23′				
Shale, dark		7	129	
Coal 0′ 10″	(4′ 0″) Middle Kittanning (2031′ L.) (No. 709 on Map IV)	4	133	59′
Coal, bony 1 6				
Coal, good 1 8				

	Thickness. Feet.	Total. Feet.	
Shale, gray	2	135	
Coal (0′ 6″)	0.5	135.5	
Shale, sandy	11.5	147	
Slate, black	2	149	
Coal .... 1′ 0″ Slate, black, bony ..... 1 0 Coal .... 2 2 (4′ 2″) Lower Kittanning 2011′ L.) (No. 709 on Map IV)	4	153	20′
Fire clay shale, gray	10	163	
Sandstone, shaly at top, Clarion	10	173	
Slate, black	0.5	173.5	
Coal .... 1′ 1″ Slate, gray.... 0 6 Coal .... 1 2 (2′ 9″) Clarion (1988′ L.) (No. 830 on Map IV)	2.5	176	28′
Slate, gray, to grade	1	177	

The following section was measured with aneroid by Teets and the writer, descending the hill just west of Gale, some of the exposures being on the east side of the Middle Fork River, along the railroad grade:

Gale Section, Washington District.

	Thickness. Feet.	Total. Feet.	
Pottsville Series (280′)			
Sandstone, massive, cliff rock, Homewood	30	30	
Concealed	193.5	223.5	
Coal, in spring, Quakertown (1915′ B.) reported	1.5	225	225′
Concealed and sandstone, massive	22	247	
Coal ...... 1′ 1″ Coal, bony .. 0 8 Coal, soft ... 1 4 (3′ 1″) Campbell Creek (No. 2 Gas) (1870′ L.) (Moore, Keppel & Co. R. R. Exposure, No. 939 on Map IV)	3	250	25′
Fire clay shale	1	251	
Sandstone, hard	0.5	251.5	
Shale, dark-gray with iron ore to R. R. grade	6	257.5	
Concealed to Middle Fork River	21	278.5	
Coal, reported in river, Powellton	1.5	280	30′

The following section was measured with aneroid by Teets, descending the hill road immediately northwest of Kedron:

Kedron Section, Washington District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (65')			
Sandstone, massive, gray, **East Lynn**	20	20	
Shale and concealed	3	23	
Slate, black	2	25	
Coal 0' 8" Slate, black 0 11 **Coal** 0 6 Slate 0 3 **Coal, soft** 2 4 (4' 8") **Lower Kittanning** (2070 B.) (Alvin Osborne Mine, No. 740 on Map IV)	5	30	30'
Slate and concealed	35	65	
Pottsville Series (185')			
Sandstone, massive 25' Shale, sandy and sandstone 10 Shale, sandy 10 Sandstone 21 **Homewood**	66	131	
Fire clay	4	135	
Shale, sandy	5	140	
Sandstone	10	150	
Shale, sandy	12	162	
Fire clay, hard, flinty	3	165	
Coal stain (0' 1"), Lower Mercer (1935' B.)	...	165	135'
Shale, sandy	10	175	
Sandstone, **Upper Connoquenessing**	40	215	
Shale, sandy	14	229	
Slate, black, Quakertown Coal horizon (1870' B.)	1	230	65'
Shale, sandy, and sandstone to bed of Right Fork of Middle Fork River	20	250	

The following section, arranged in descending order, was made with hand-level by Teets up the hill road immediately southwest of Queen, along the strike of the rocks, the Wamsley mine and remaining upper portion being supplied from points farther west where the rocks dip to a lower level:

Queen Section, Washington District

	Thickness. Feet.	Total. Feet.	
Allegheny Series (72')			
Concealed	10	10	
Sandstone, massive, pebbly, **East Lynn**	25	35	
Concealed and sandstone	13	48	
Coal, soft 2' 4" **Coal, bony** 0 8 **Coal, soft** 1 8 (4' 8") **Middle Kittanning** (Ernest Wamsley Mine, No. 722 on Map IV)	5	53	53'
Slate and concealed	13	66	
Coal, Lower Kittanning (2208' L.) reported	6	72	19'
Pottsville Series (384')			
Sandstone, **Homewood**, and concealed	48	120	

	Thickness. Feet.	Total. Feet.	
Coal, Upper Mercer (2260' B.) (Blaine Koon Mine, No. 847 on Map IV)	3	123	51'
Slate	2	125	
Sandstone	10	135	
Shale, sandy	5	140	
Sandstone, massive, medium-grained to coarse, Upper Connoquenessing	40	180	
Shale, sandy, and concealed	97	277	
Fire clay	3	280	
Shale, sandy, and concealed	50	330	
Sandstone, massive, medium-grained	25	355	
Sandstone, concealed, and shale, sandy	99	454	
Coal, Campbell Creek (1924' L.), reported	2	456	

In the following section, arranged in descending order, the upper portion was measured with aneroid by Teets and the writer, starting at the top of a hill 1 mile southeast of Queen and descending along the road northeastward to Sunny Point School, on Laurel Run of Right Fork of Middle Fork River. The lower portion is the record of the J. K. P. Koon Heirs No. 1 (59) Well, located at the foot of the measured section, and owned by the Pittsburgh and West Virginia Gas Company, part of the record being furnished by officers of that company and the remainder by Claude W. Maxwell, of Elkins. W. Va. The well was drilled to a great depth, but was abandoned as a dry hole, having made shows of gas only in the Gordon Stray Sand and in another that seems to represent a member of the Warren Group of northwestern Pennsylvania:

Sunny Point Section, Washington District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (20')			
Concealed	20	20	
Pottsville Series (842')			
Sandstone, massive, partly concealed in bluff, Homewood	75	95	95'
Concealed	70	165	
Shale, sandy, with iron ore	5	170	
Sandstone, massive.10' Concealed ....35 Sandstone, partly concealed ......20 } Upper Connoquenessing	65	235	140'
Concealed	54	289	
Fire clay, Campbell Creek Coal horizon	1	290	55'
Concealed	45	335	
Coal blossom, Powellton (2140' B.)	...	335	45'

	Thickness. Feet.	Total. Feet.	
Concealed	2	337	
Sandstone	10	347	
Concealed with shale	13	360	
Coal blossom, Eagle (2115' B.)	...	360	25
Fire clay	2	362	
Sandstone, shaly, to well mouth	30	392	
Continued by J. K. P. Keen Heirs No. 1 (59) Well Record (2068' L.):			
Red rock? (red from oxidation, I. C. W.)	17	409	
Lime	73	482	
Shells	30	512	
Sand, limy, Salt	220	732	
Slate	10	742	
Sand, Salt	45	787	
Sand, limy, Salt	15	802	
Sand, white, Salt	60	862	502'
Mauch Chunk Series (445')			
Slate	10	872	
Lime	20	892	
Lime, red	130	1022	
Lime and sand, Maxton	250	1272	
Lime and shells	35	1307	445'
Greenbrier Limestone (93')			
Lime, Big	85	1392	
Slate	8	1400	
Pocono Series (262')			
Sand, Big Injun	77	1477	
Slate	10	1487	
Sand, pebbly, Squaw	12	1499	
Lime and shells	163	1662	
Catskill Series (665')			
Lime, red	105	1767	469'
Sand, Fifty-foot	15	1782	
Lime and red rock	47	1829	
Lime, gritty	16	1845	
Red rock	57	1902	
Sand, Gordon Stray (gas, 1550')	45	1947	
Red rock and shells	69	2016	249'
Sand, Gordon	22	2038	
Red rock	12	2050	
Lime	15	2065	
Sand, limy, Fourth	22	2087	
Slate	10	2097	
Sand	7	2104	
Lime	25	2129	
Lime and shells	30	2159	143
Sand, Fifth	14	2173	
Slate	17½	2190½	
Lime and shells	126½	2317	158
Sand, limy, Elizabeth	10	2327	
Chemung Series (405')			
Lime and shells	250	2577	250'
Sand (little gas) ... 20' Break .... 2 Sand 13	**(Warren Second?)** 35	2612	

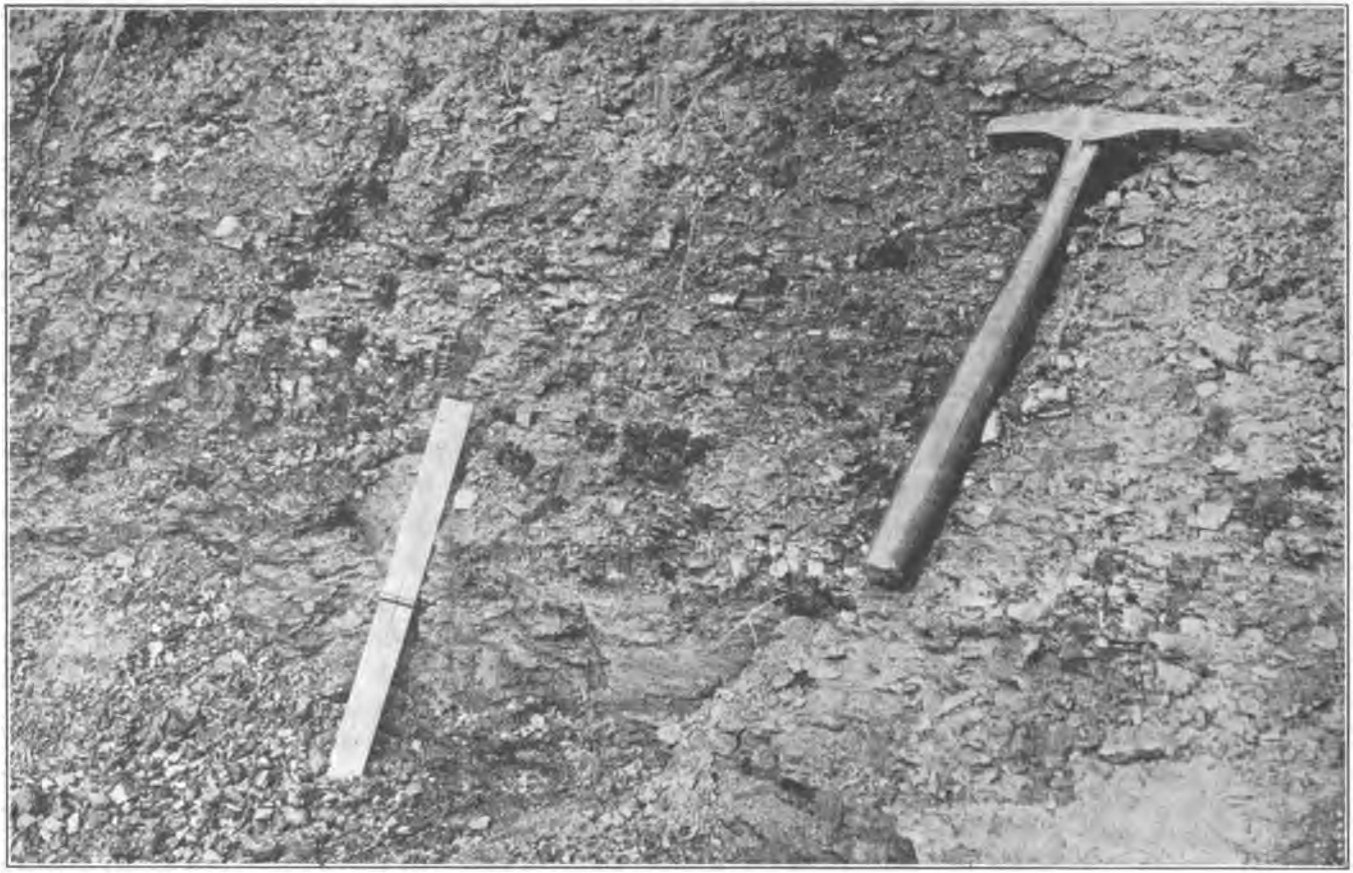

PLATE IX.—Ames Shale and Harlem Coal in public road 0.7 mile north of Volga, Barbour County; One-foot rule at base of picture shows approximate thickness of coal.

	Thickness. Feet.	Total. Feet.	
Concealed	2	337	
Sandstone	10	347	
Concealed with shale	13	360	
Coal blossom, Eagle (2115' B.)	...	360	25'
Fire clay	2	362	
Sandstone, shaly, to well mouth	30	392	
Continued by J. K. P. Koon Heirs No. 1 (59) Well Record (2083' L.):			
Red rock? (red from oxidation, I. C. W.)	17	409	
Lime	73	482	
Shells	30	512	
Sand, limy, Salt	220	732	
Slate	10	742	
Sand, Salt	45	787	
Sand, limy, Salt	15	802	
Sand, white, Salt	60	862	502'
Mauch Chunk Series (445')			
Slate	10	872	
Lime	20	892	
Lime, red	130	1022	
Lime and sand, Maxton	250	1272	
Lime and shells	35	1307	445'
Greenbrier Limestone (93')			
Lime, Big	85	1392	
Slate	8	1400	
Pocono Series (262')			
Sand, Big Injun	77	1477	
Slate	10	1487	
Sand, pebbly, Squaw	12	1499	
Lime and shells	163	1662	
Catskill Series (665')			
Lime, red	105	1767	460'
Sand, Fifty-foot	15	1782	
Lime and red rock	47	1829	
Lime, gritty	16	1845	
Red rock	57	1902	
Sand, Gordon Stray (gas, 1530')	45	1947	
Red rock and shells	69	2016	249'
Sand, Gordon	22	2038	
Red rock	12	2050	
Lime	15	2065	
Sand, limy, Fourth	22	2087	
Slate	10	2097	
Sand	7	2104	
Lime	25	2129	
Lime and shells	30	2159	143'
Sand, Fifth	14	2173	
Slate	17½	2190½	
Lime and shells	126½	2317	158'
Sand, limy, Elizabeth	10	2327	
Chemung Series (1057')			
Lime and shells	250	2577	260'
Sand, (little gas)...20' Break ... 2 Sand ... 13 } **Warren Second?**	35	2612	

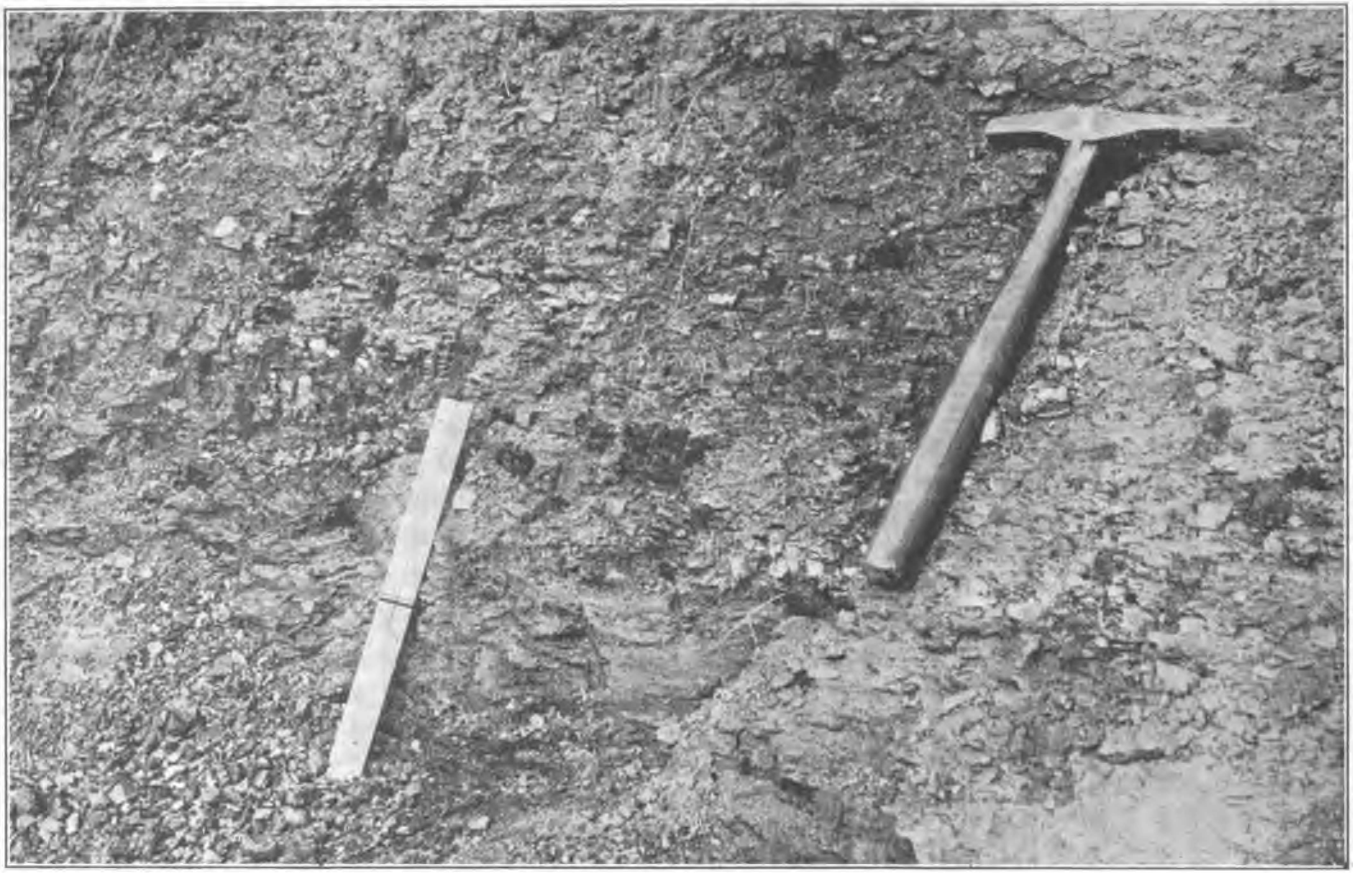

PLATE IX.—Ames Shale and Harlem Coal in public road 0.7 mile north of Volga, Barbour County; One-foot rule at base of picture shows approximate thickness of coal.

	Thickness. Feet.	Total. Feet.
Lime and slate	185	2797
Slate, black	3	2800
Lime and shells	222	3022
Sand, dark, Speechley?	10	3032
Lime	10	3042
Sand	45	3087
Break	4	3091
Sand	21	3112
Slate	5	3117
Sand, Cherry Grove?	15	3132
Lime and shells to bottom	252	3384

In the following section the principal portion was made by Teets with aneroid, descending the hill road immediately northwest of Hemlock, but that portion between the Lower Mercer and Quakertown Coals was observed along the public road 0.6 mile southwest of Hemlock, where the writer discovered the fossils of the Kanawha Black Flint, coming 31 feet above the Quakertown Coal which was traced from Hemlock southwestward along the road, and lying just above another small streak of coal. The interval of the Black Flint from the top of the Homewood Sandstone, 174 feet, is practically the same as that found at Bablin, Lewis County, where the writer, in a previous Report[1], found this interval to be 170.5 feet, where the Homewood directly underlies the Lower Kittanning Coal. At Hemlock this coal has been eroded from the hilltops, but the Homewood was traced westward along the ridge road just south of Panther Fork until the Lower Kittanning Coal was found just above it in the neighborhood of Stockerts where its position was not a matter of question. The discovery of the Kanawha Black Flint in these northern counties at practically the same interval below the Lower Kittanning or No. 5 Block Coal as found between the same horizons in the Great Kanawha Valley, indicates beyond question that the principal southward thickening in the Pottsville Group must occur below the Black Flint:

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[1] Lewis and Gilmer Report, W. Va. Geol. Survey, pp. 71-73; 1916.

Hemlock Section, Washington District.

	Thickness. Feet.	Total. Feet.	
Pottsville Series (400′)			
Concealed in bluff........50′ Sandstone, massive, cliff rock ....24 } Homewood..	74	74	
Coal blossom, Upper Mercer................	1	75	75′
Shale, sandy and concealed.................	29	104	
Coal blossom.............................	1	105	30′
Shale, sandy................................	40	145	
Sandstone and concealed...................	26.5	171.5	
Shale, sandy, with plant fossils.............	2	173.5	
Slate, dark, with marine fossils, Spirifer, Derbya, etc., **Kanawha Black Flint**......	0.5	174	69′
Coal and slate, Lower Mercer (Stockton)....	1	175	
Concealed	24	199	
Slate	3	202	
Coal ....0′ 3 ″ Slate ....0 0½ **Coal** ....0 6½ Slate, dark..0 3 **Coal, soft**....1 9 } **(2′ 10″) Quakertown** (2580′ B.) (H. A. Zickefoose Mine, No. 899 on Map IV).	3	205	31′
Shale, sandy and concealed................	75	280	
Sandstone	20	300	
Shale, sand, and concealed.................	20	320	
Sandstone, massive, coarse-grained.........	25	345	
Shale and sandstone to bottom.............	55	400	

GENERAL SECTIONS, BANKS DISTRICT, UPSHUR.

Banks District occupies the extreme southwestern end of Upshur, next to Lewis, Webster, and Randolph Counties. In the northwest corner the surface rocks are those of the Conemaugh Series, but the southeastward rise soon carries these above the hills so that the Allegheny and Pottsville come to the surface and cover all the southern end.

In the following section, arranged in descending order, the upper portion was made with aneroid by the writer at the south portal of the Coal and Coke Railway tunnel 1.2 miles north of Frenchton. The lower portion is the record of the Hazen Phillips No. 2658 (61) Well, drilled by the Frenchton Oil and Gas Company, but now owned by the Hope Natural Gas Company, and located one-third mile south of the tunnel mouth. The well is a light gas producer from the Gordon Sand:

Frenchton Section, Banks District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (336')			
Sandstone, shaly	...	...	
Shale, greenish and sandy, Ames (1645' B.)	2	2	2'
Shale, red, with numerous plant fossils	5	7	
Shale, variegated and concealed, Pittsburgh Reds	40	47	
Shale, sandy, Jane Lew Sandstone	10	57	
Shale, variegated and limy with some sandy layers	44	101	
Shale, dark, bituminous	1	102	
Shale, gray, to railroad grade	4	106	
Concealed	16	122	
Coal streak, Bakerstown	...	122	120'
Continued by Hazen Phillips No. 2658 (61) Well Record (1525'B.):			
Conductor	12	134	
Lime	10	144	
Slate, black	38	182	
Sand	20	202	
Slate and shells	30	232	
Sand, Little Dunkard	20	252	
Slate	46	298	
Sand, Big Dunkard	38	336	214'
Allegheny Series (241')			
Slate	20	356	
Sand, Upper Freeport	10	366	
Slate	6	372	
Sand	6	378	
Slate	29	407	
Sand, Burning Springs	29	436	
Slate and shells	46	482	
Gas Sand	24	506	
Slate	46	552	
Sand, Clarion	20	572	
Slate	5	577	241'
Pottsville Series (625')			
Sand, Second Cow Run, Homewood (reduced hole at 502')	80	657	
Slate	20	677	
Sand, hard	5	682	
Unrecorded (water)	25	707	
Shale, black	20	727	
Lime, gritty	59	786	
Shale, black	36	822	
Sand, Salt	20	842	
Shale, black	40	882	
Sand, Salt	30	912	
Shale, black	30	942	
Sand, Salt	50	992	
Slate and shells	48	1040	
Sand, Salt	82	1122	
Shale, black	15	1137	
Sand, Salt	65	1202	

	Thickness. Feet.	Total Feet.	
Mauch Chunk Series (429')			
Shale, black	30	1232	
Slate and shells	85	1317	
Lime, gritty	15	1332	
Sand	4	1336	
Slate, black	6	1342	
Sand, Maxton	95	1437	860'
Slate and shells	80	1517	
Red rock	5	1522	
Lime	15	1537	
Slate, white, and shells	41	1578	
Lime, gritty	44	1622	
Slate	6	1628	
Red rock	3	1631	194'
Greenbrier Limestone (111')			
Big Lime (gas, 1511')	111	1742	
Pocono Series (310')			
Sand, Big Injun	165	1907	
Slate	7	1914	
Sand, Squaw	40	1954	
Slate	12	1966	
Sand, Weir (oil, 1865')	41	2007	
Slate (reduced hole at 1885')	5	2012	421
Sand, Berea	40	2052	
Catskill Series (420')			
Red rock	12	2064	
Sand, Fifty-foot	12	2076	
Red rock and shells	170	2246	
Slate	6	2252	
Sand, Gordon Stray	24	2276	
Slate, white	46	2322	310'
Sand ....20' Slate .... 6 Sand (gas, 2240'-2250')....26 } Gordon	52	2374	
Slate, white	38	2412	
Sand, Fourth	17	2429	
Slate, white, to bottom	43	2472	

6⅝" casing, 1898'; packer on bottom.

The following section, arranged in descending order, was measured with hand-level by the writer starting at Arlington, on the Little Kanawha River, and working southward to the top of the hill:

Arlington Section, Banks District.

	Thickness. Feet.	Total. Feet.
Conemaugh Series (99')		
Sandstone, massive, cliff rock, from top of knob	28	28
Concealed in slope	71	99

	Thickness. Feet.	Total. Feet.	
Allegheny Series (224')			
Bench, Upper Freeport Coal horizon........	...	99	99'
Concealed in bluff.........................	40	139	
Spring, Lower Freeport Coal horizon........	...	139	
Concealed in steep bluff..................	65	204	
Spring, Upper Kittanning Coal horizon (1721' B.)................................	....	204	105'
Concealed in steep bluff....................	65	269	
Sandstone, massive, East Lynn.............	5	274	
Slate, black, cannel.......................	1	275	
Slate, dark, soft (0' 2")...................	...	275	
Coal, soft..0' 8" Bone ......1 0 Coal ....0 9 Bone ......0 4 Coal ....2 2 4' 11" Middle Kittanning Coal (1645' B.) (Fidler Mine No. 761 on Map IV)	5	280	76'
Concealed	32	312	
Coal blossom, Lower Kittanning............	...	312	32'
Concealed	10	322	
Coal, Clarion, reported....................	1	323	
Pottsville Series (132')			
Sandstone, massive, cliff rock, Homewood...	12	335	
Coal blossom...............................	...	335	
Shale, sandy and concealed.................	34	369	
Coal (0' 9"), Upper Mercer.................	1	370	58'
Shale, gray................................	5	375	
Concealed	10	385	
Sandstone, massive, cliff rock...............	14	399	
Concealed and sandstone, shaly............	14	413	
Coal, Lower Mercer (Stockton), reported...	1	414	44'
Concealed	6	420	
Sandstone, hard............................	2	422	
Concealed	8	430	
Sandstone, massive, cliff rock, makes falls in Little Kanawha River, Upper Connoquenessing	25	455	

The following section was measured with aneroid by the writer down a steep hill road southeastward to Cow Run of Little Kanawha River, one mile northwest of Arlington. Owing to the rapid southeastward rise of the measures, the intervals are much shorter than true vertical measurement would show:

Cow Run Section, Banks District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (185')			
Sandstone, massive, capping knob, Saltsburg	30	30	
Fire clay and coal blossom, Bakerstown (1825' B.)................................	...	30	30'
Concealed	10	40	

	Thickness. Feet.	Total. Feet.	
Sandstone, massive, soft, Buffalo...........	35	75	
Shale, dark, with marine fossils, Brush Creek	5	80	
Coal streak, Brush Creek (1775′ B.).........	...	80	50′
Fire clay shale, partly concealed............	40	120	
Shale, variegated and red.................	5	125	
Shale and concealed......................	10	135	
Sandstone, massive, Mahoning............	50	185	105′
Allegheny Series (127′)			
Shale, sandy, partly concealed............	65	250	
Spring, fire clay horizon..................	...	250	
Sandstone, massive.......25′			
Concealed ....20 } East Lynn...	55	305	
Sandstone, massive.......10			
Coal, in Cow Run, Lower Kittanning, reported	7	312	127′

The following section was measured with aneroid by the writer, starting at the top of the hill 0.7 mile southeast of Stillman and working down the hill road northwestward to the Little Kanawha River:

Stillman Section, Banks District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (115′)			
Concealed and sandstone from top of hill...	40	40	
Coal blossom, Brush Creek (1880′ B.).......	...	40	40′
Fire clay and concealed..................	10	50	
Sandstone, Upper Mahoning...............	15	65	
Fire clay, plastic, Thornton...............	15	80	
Sandstone, partly concealed, Lower Mahoning	35	115	75′
Allegheny Series (215′)			
Concealed	70	185	
Sandstone and concealed..................	30	215	
Fire clay spring, Upper Kittanning Coal horizon	...	215	100
Concealed	60	275	
Fire clay, plastic.........................	5	280	
Shale, sandy, and concealed...............	20	300	
Coal blossom, Lower Kittanning (1620′ B.)..	...	304	85′
Concealed and sandy shale................	30	330	
Fire clay streak.........................	...	330	
Pottsville Series (60′)			
Sandstone, massive, cliff rock, Homewood...	35	365	
Slate and coal blossom, Upper Mercer......	...	365	65
Concealed to Little Kanawha River.........	25	390	

The following section, arranged in descending order, was measured with hand-level, starting at Holly Grove on the Little Kanawha River and working eastward up the hill. Owing to the eastward rise the intervals are greater than true vertical measurement would show:

Holly Grove Section, Banks District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (202')			
Sandstone, massive, pebbly, partly concealed from top of knob, **Buffalo**...............	40	40	40'
Concealed along slope.....................	30	70	
Sandstone and concealed...................	44	114	
Concealed and sandstone, pebbly, **Mahoning**	88	202	162'
Allegheny Series (204')			
Concealed along bench, with fire clay and iron ore............................	12	214	
Concealed in steep bluff, mostly sandstone..	73	287	
Coal blossom at spring, Upper Kittanning (1939' L.)................................	...	287	85'
Concealed in slope........................	43	330	
Concealed in steep bluff....................	31	361	
Concealed in slope........................	35	396	
Coal opening, abandoned, Lower Kittanning (1820' L.)...............................	...	396	109'
Concealed and sandstone, **Clarion**..........	10	406	
Pottsville Series (84')			
Sandstone, massive, cliff rock, **Homewood**..	23	429	
Concealed	45	474	
Black slate and coal, Upper Mercer.........	3	477	81'
Fire clay..................................	5	482	
Sandstone, massive, to Little Kanawha River	8	490	

The following section was made by the writer with hand-level, starting at the Little Kanawha River one-third mile southeast of Canaan and working westward up the hill to the high point just south of the village. The Lower Kittanning Coal mine noted in the section is located just northeast of the village, but was easily inserted in the section from its relation to the great Homewood Sandstone cliff:

Canaan Section, Banks District.

		Thickness. Feet.	Total. Feet.	
Allegheny Series (110')				
Sandstone, massive, partly concealed from top of knob ....32' Concealed ....38 Sandstone, massive.......25	**East Lynn**...	95	95	
Coal ....1' 8" **Bone coal**..0 4 **Coal, reported**..3 0	(5' 0") **Lower Kittanning** (Herbert Bellingham Mine, No. 782 on Map II)	5	100	100
Concealed		10	110	
Pottsville Series (190')				
Sandstone, massive, pebbly, great cliff, **Homewood**		45	155	

	Thickness. Feet.	Total. Feet.	
Coal, Upper Mercer, reported	1.5	156.6	56.5'
Concealed and slate	40	196.5	
Coal ......1' 4" **Coal, splinty.0 10** **Coal ......1 2** **(3' 4") Lower Mercer (Stockton) (2205' B.) (Herbert Bellingham Mine, No. 876 on Map II).**	3.5	200	43.5'
Concealed to Little Kanawha River	100	300	

The following section, arranged in descending order, and made by the writer near Cleveland, was previously published by the Survey[2], but owing to its bearing on the geology of southwestern Upshur and on account of a few slight revisions made by Ray V. Hennen during his studies of the neighboring area of Braxton, and concurred in by the writer, it is here republished in full. As explained in the Lewis County Report, a careful hand-level section was first made from Cleveland northward up the mountain to the Upper Mahoning Sandstone which caps it, the measurement including the Upper Kittanning and Stockton "A" Coals. Afterward, another hand-level section was measured, starting at the Upshur-Lewis line on Flat Run, one mile northwest of Cleveland, and measuring up to the same opening in the Upper Kittanning Coal. This section included the Middle and Lower Kittanning Coals and the Kanawha Black Flint horizon. By compiling up the two measurements a section 775 feet long is obtained that includes all the important formations found in this locality. A careful search was made on both sides of the river for fossils at the Black Flint horizon by both Dr. Price and the writer, without success, but its place does not seem subject to much doubt, since its interval below the Lower Kittanning Coal is about the same as at Bablin, a few miles away.

The lower part of the section is the record of the Vandervort and Pickens No. 1 (81) oil well, drilled by Meade Bros. for the Haddix and Leading Creek Oil and Gas Company, and first published by the Survey in Vol. I(a), page 393. By determining the rise of the rocks between two openings in the Lower Kittanning Coal on either side, the well mouth was found to be about 460 feet above this horizon:

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[2] D. B. Reger, Lewis and Gilmer Rept., W. Va. G. S., p. 75; 1916.

Cleveland Section, Corner of Lewis, Upshur, and Webster Counties.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (100')			
Sandstone, massive, gray, pebbly, capping knob, **Upper Mahoning**	60	60	
Fire clay along bench, **Thornton**	...	60	
Shale, gray, sandy	40	100	
Allegheny Series (260')			
Shale, gray, sandy, with plant fossils and iron ore, **Upper Freeport**	15	115	115'
Sandstone, shaly, **Upper Freeport**	28	143	
Concealed in bench	22	165	
Sandstone, partly concealed in bluff, **Lower Freeport**	35	200	
Concealed	15	215	
Shale, gray, sandy, with plant fossils	11	226	
Coal ......0' 4" Shale, dark....0 7 **Coal** ......2 8 (3' 7") Upper Kittanning (1780' L.) (John Beverage Mine, No. 547 on Map IV)	4	230	115'
Concealed	35	265	
Sandstone, massive, pebbly, cliff rock, **East Lynn**	30	295	
Concealed	9	304	
Coal blossom, Middle Kittanning	1	305	75'
Concealed	12	317	
Sandstone, massive, cliff rock, with numerous plant fossils at base	35	352	
Coal ....3' 8" Slate, black...1 0 **Coal** ....0 11 Slate, black...0 1 Coal, visible...2 8 (8' 4") **Lower Kittanning** (1665' B.) (Nimrod Lake Mine, No. 784 on Map IV).	8	360	55'
Pottsville Series (618')			
Steep slope, with massive sandstone, **Homewood**	90	450	
Coal opening, thickness concealed, not much found, Upper Mercer (Stockton "A") (1590' L.)	...	450	90'
Concealed in steep slope	85	535	
Fire clay spring, **Kanawha Black Flint horizon**	...	535	85'
Concealed in bench	10	545	
Concealed in slope	45	590	
Sandstone, massive, cliff rock, **Upper Winifrede**	50	640	
Concealed	90	730	
Sandstone, massive, partly concealed, to Little Kanawha River, **Cleveland**	45	775	
Interval	45	820	
Continued by Record of Vandervort and Pickens No. 1 (81) Well (1220' B.):			
Quicksand	25	845	
Sand, white, hard (conductor, 35')	25	870	

		Thickness. Feet.	Total. Feet.	
Lime and slate		75	945	
Sand, hard and poor		33	978	
Mauch Chunk Series (802')				
Lime		25	1003	
Shale and lime		89	1092	
Lime, sandy		93	1185	
Shale, white		20	1205	
Lime, sandy, shale and red rock		515	1720	1185'
Sand, Maxton		25	1745	
Lime, sandy		25	1770	
Shale, black		10	1780	60'
Greenbrier Limestone (165')				
Big Lime		165	1945	
Pocono Sandstones (425')				
Sand (cave, 1200'; salt water, 1225')........100' Sand and lime (cased, 6⅝") 40	Big Injun	140	2085	
Red rock		20	2105	
Lime, sandy		215	2320	540'
Sand, gray, Berea		50	2370	
Catskill Series (257')				
Shells, sandy, and slate		50	2420	
Lime, shells, and slate		100	2520	
Lime, sandy		50	2570	
Lime, shells and slate, to bottom		57	2627	

The following section was made with aneroid by the writer, starting at the top of the hill 1.3 miles northeast of Cleveland, and descending southwestward down the hill road to the Little Kanawha River at the mouth of Honey Camp Run:

Honey Camp Section, Banks District.

	Thickness. Feet.	Total. Feet.	
Conemaugh Series (90')			
Sandstone, massive, soft, pebbly, from top of hill, Upper Mahoning	25	25	
Shale and concealed	55	80	
Fire clay	...	80	
Sandstone, Lower Mahoning	10	90	90'
Allegheny Series (210')			
Shale, sandy	10	100	
Sandstone, massive, Upper Freeport	40	140	
Concealed	10	150	
Coal blossom, Lower Freeport (1930' B.)	...	150	60'
Sandstone, massive, Lower Freeport	55	205	
Concealed	35	240	
Coal blossom, Middle Kittanning (1840' B.)	...	240	90'
Shale and fire clay	10	250	
Sandstone, massive	15	265	

	Thickness. Feet.	Total. Feet.	
Concealed	25	290	
Coal blossom, Lower Kittanning (1790' B.)	...	290	50'
Fire clay	10	300	
Pottsville Series (480')			
Sandstone, massive, Homewood	25	325	
Concealed and sandy shale	20	345	
Sandstone	35	380	
Coal blossom, Upper Mercer (1700' B.)	...	380	90'
Concealed	60	440	
Coal blossom, Lower Mercer (1640' B.)	...	440	60'
Concealed	75	515	
Coal blossom, Quakertown (1565' B.)	...	515	75'
Concealed	25	540	
Fire clay	...	540	
Concealed	35	575	
Black slate and coal blossom, Campbell Creek (1505' B.)	...	575	60'
Concealed	100	675	
Fire clay, streak	...	675	
Concealed	65	740	
Sandstone, massive, Cleveland, to Little Kanawha River	40	780	

Along the Buckhannon River in the eastern corner of Banks District, several borings have been made for oil and gas and coal, affording a good opportunity to connect surface measurements with the records of some of these holes. In the following section, arranged in descending order, the surface portion was made with hand-level by the writer, starting at Newlon on the Buckhannon River and working westward up the hill and southwestward along the ridge to a point 0.9 mile southwest of Newlon where the Homewood Sandstone cliff caps the hill. The lower portion is the record of the Buckhannon Chemical Company No. 1 (90) Well, drilled by the company on its own property at the foot of the measured section at Newlon, the record being furnished the Survey by Wm. McDade, General Manager of the plant of the company at Chemical. The well was a dry hole:

Newlon Section, Banks District.

	Thickness. Feet.	Total. Feet.
Pottsville Series (1053')		
Sandstone, massive, pebbly from top of knob, Homewood	40	40
Concealed	80	120
Sandstone, massive, Upper Connoquenessing	30	150

	Thickness. Feet.	Total. Feet.	
Concealed in bench, **Quakertown Coal horizon**	5	155	155′
Sandstone, massive, **Lower Connequenessing**	48	203	
Concealed in bench	12	215	
Sandstone, partly concealed, **Upper Cedar Grove**	46	261	
Coal prospect, (none found?), Cedar Grove	...	261	
Sandstone and concealed	66	327	
Slate, black, at spring	...	327	
Concealed and sandstone	30	357	
Shale, dark-gray, with ferriferous limestone nodules, **Campbell Creek Limestone** (4′ 4″)	4	361	
Coal, Campbell Creek (2095′ L.) (1′ 8″), (Prospect No. 933A on Map IV)	2	363	208′
Sandstone, massive	23	386	
Concealed in bench (prospected for coal, but none found)	10	396	
Concealed in steep bluff, mostly sandstone	90	486	
Slate, black, thickness concealed	...	486	
Concealed with sandstone	47	533	
Shale, dark, sandy, laminated, with turtle-back limestone concretions, **Newlon**, to top of boring	20	553	
Continued by Buckhannon Chemical Company No. 1 (90) Well Record (1906′ L.):			
Sand and gravel	12	565	
Shale, black (conductor, 16′)	18	583	
Sand, hard, **Upper Nuttall**	50	633	
Slate, black	25	658	
Sand, **Lower Nuttall**	25	683	
Coal, Hughes Ferry	1	684	321
Sand	29	713	
Lime	40	753	
Slate	40	793	
Lime	65	858	
Sand	20	878	
Slate	15	893	
Lime	15	908	
Slate (8″ casing)	5	913	
Sand, Salt	140	1053	369′
Mauch Chunk Series (335′)			
Slate	14	1067	
Red rock	46	1113	
Lime	60	1173	
Red rock	65	1238	
Slate	10	1248	195′
Sand, Maxton	40	1288	
Lime	35	1323	
Red rock	25	1348	
Slate	40	1388	140′
Greenbrier Limestone (35′)			
Lime, Big	35	1423	
Pocono Series (260′)			
Slate	10	1433	
Sand, Big Injun	35	1468	
Slate and shells	5	1473	

	Thickness. Feet.	Total. Feet.	
Sand, Squaw	85	1558	
Lime	125	1683	
Catskill Series (351′)			
Red rock	3	1686	
Lime	97	1783	395′
Sand, Fifty-foot?	8	1791	
Red rock and shells	147	1938	155′
Sand, Thirty-foot?	8	1946	
Red rock and shells to bottom	88	2034	

The following section, with the exception of the Lower Kittanning Coal, which crops at the top of the Silica Sand Company quarry on a level with the top of the well, is the record of the Silica Sand Company No. 3 (84) Gas Well, completed Feb. 21, 1906, by the Greater Pittsburgh Oil and Gas Company on the ridge 0.4 mile northwest of Craddock. The well has produced gas for ten years from the Big Injun Sand, but in 1915 its flow had so decreased that it was drilled deeper, the result being a failure, according to J. W. Lloyd, of Newlonton, lease superintendent, who furnished the record of the additional drilling:

Craddock Section, Banks District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series ( )			
Coal blossom, thickness concealed, Lower Kittanning	...	....	
Continued by Silica Sand Co. No. 3 (84) Well Record (2505′ B.):			
Pottsville Series (990′)			
Sand, Second Cow Run, Homewood	59	59	
Coal, Upper Mercer	6	65	65′
Sand	70	135	
Coal, Lower Mercer (Stockton)	7	142	77′
Sand	58	200	
Slate	50	250	
Sand	60	310	
Slate	20	330	
Lime	70	400	
Sand	45	445	
Slate	45	490	
Lime, gritty	45	535	
Slate	20	555	
Lime, gritty	35	590	
Coal, Eagle	3	593	451′
Lime, gritty	47	640	
Slate	10	650	

	Thickness. Feet.	Total. Feet.	
Coal, Hughes Ferry	6	656	63′
Lime	59	715	
Sand	35	750	
Slate	10	760	
Lime, gritty	76	836	
Coal, Sewell "B"	6	842	186′
Lime	23	865	
Coal, Sewell	4	869	33′
Lime, gritty (8¼″ casing, 887′)	18	887	
Lime, gritty	38	925	
Sand, Salt (gas, 930′; water, 940′ and 990′)	65	990	
Mauch Chunk Series (540′)			
Slate	20	1010	
Sand	40	1050	181′
Lime	15	1065	
Unrecorded	70	1135	
Red rock	45	1180	
Slate	20	1200	
Red rock	30	1230	
Lime	50	1280	
Red rock	60	1340	
Sand	20	1360	
Red rock	15	1375	
Sand	30	1405	
Red rock	10	1415	
Lime	15	1430	
Sand	30	1460	
Red rock	30	1490	
Lime	10	1500	450′
Sand, Maxton (oil, 1530′)	30	1530	30′
Greenbrier Limestone (257′)			
Big Lime (6⅝″ casing, 1730′)	257	1787	
Pocono and Catskill Series (433′)			
Sand, Big Injun (gas, 1800′ and 1818′)	41	1828	
Unrecorded to bottom	10	1838	
Drilled deeper in 1915:			
Red rock	4	1842	
Slate and shell	48	1890	
Red rock	10	1900	
Slate and shell	10	1910	
Red rock	4	1914	
Slate and shell	16	1930	
Red rock and shells	5	1935	
Slate and shells	15	1950	
Red rock and shells	175	2125	
Lime	25	2150	
Red rock and shells	70	2220	

In the following section, arranged in descending order, the surface portion was measured with aneroid by Teets, descending the hill eastward to the Lick Run road at a point 0.3 mile south of Palace Valley. The lower portion is the record of the Elkhorn Coal Corporation No. 1 (120) Coal Test drilled on its property on Lick Run in Randolph County, 0.7 mile south of Palace Valley and 0.4 mile south of the base of the measured section, the southward rise of the rocks being practically equal to the difference of level (70′) between the two points so that the stratigraphic sequence should be complete. The record of this hole was furnished the Survey by Brooks Fleming, Jr., Assistant Manager of the Consolidation Coal Company, of Fairmont, W. Va.:

Palace Valley Section, Banks District.

	Thickness.		Total.		
Pottsville Series (642′)	Ft.	In.	Ft.	In.	
Concealed to bench	80	0	80	0	
Shale, sandy and concealed	75	0	155	0	
Sandstone, massive cliff, gray, hard, medium-grained	25	0	180	0	
Shale, sandy, and sandstone	62	9	242	9	
Coal, Gilbert (2445′ B.) (Steven Morgan Mine No. 1015 on Map IV)	2	3	245	0	245′
Slate	5	0	250	0	
Sandstone and sandy shale	15	0	265	0	
Sandstone, soft	30	0	295	0	
Shale, sandy and concealed to bench	70	0	365	0	
Sandstone and sandy shale	54	0	419	0	
Coal blossom, Castle (supplied from east side of river)	1	0	420	0	175′
Continued by Elkhorn Coal Corporation No. 1 (120) Coal Test Record (2340′ B.):					
Surface	30	0	450	0	
Shale	2	0	452	0	
Slate	0	9	452	9	
Coal smut	0	3	453	0	
Fire clay	3	0	456	0	
Shale	14	0	470	0	
Slate	0	2	470	2	
Coal, Sewell "B"	0	10	471	0	51′
Fire clay	5	3	476	3	
Slate and **coal**	1	0	477	3	
Shale	4	2	481	5	
Slate and **coal**	0	10	482	3	
Soapstone	3	9	486	0	
Shale	1	8	487	8	
Slate	1	1	488	9	
Fire clay	6	0	494	9	
Slate	0	6	495	3	
Coal 0′ 4″ Shale 6 1 **Coal** 0 2 **Sewell**	6	7	501	10	30′ 10″

	Thickness.		Total.		
	Ft.	In.	Ft.	In.	
Shale	21	8	523	6	
Sandstone .....72′ 11″ Conglomerate...38 0 } Sharon....	110	11	634	5	
Fire clay	1	0	635	5	
Conglomerate	1	7	637	0	
Sandstone	5	0	642	0	140′ 2″
Mauch Chunk Series (163′ 6″)					
Shale	21	6	663	6	
Sandstone	23	0	686	6	
Shale	5	6	692	0	
Sandstone	17	0	709	0	
Shale and sulphur balls	10	5	719	5	
Sandstone and sulphur balls	10	0	729	5	
Sandstone	23	0	752	5	
Shale	1	0	753	5	
Red shale	36	9	790	2	
Gray shale	2	2	792	4	
Red shale	1	0	793	4	
Gray shale	2	2	795	6	
Sandstone	10	0	805	6	

SECTIONS IN WESTERN PORTION OF RANDOLPH COUNTY.

GENERAL SECTIONS, LEADSVILLE DISTRICT, RANDOLPH.

In western Randolph the surface rocks are principally those of the Allegheny and Pottsville Series, only a small amount of the Conemaugh being represented in the northwestern corner. The steep eastward rise of the rocks along the Laurel Ridge and Rich Mountain brings the Mississippian measures to the surface, but little dependence could be put in any measurement of them in their tilted and broken condition, and their description belongs rather to that portion of Randolph east of these mountains than to this Report.

In the following section, arranged in descending order, the surface portion was measured with hand-level by Teets and the writer at the Kaufman Church on the east side of the Tygart Valley River, 1 mile southwest of Gage, and just south of the Randolph-Barbour Line. The lower portion is the record of the Coberly No. 1 (105) Coal Test, drilled by the Western Maryland Railway Company at the foot of the measured section, and previously published by Dr. White in Vol. II, page 360, of the Survey. In the surface portion the Lower Kittanning Coal was identified at an abandoned open-

ing near the church, but the section as published is that obtained at the Gage mine where all the coal was exposed:

Gage Section, Leadsville District.

		Thickness.		Total.		
		Ft.	In.	Ft.	In.	
Allegheny Series (142′ 1″)						
Concealed from top of hill		100	0	100	0	
Coal, cannel..0′ 10″ Slate, black...0 10 Bone ....0 5 Coal, soft.....2 6 Slate, dark....0 10 Coal, soft......1 0 Slate, dark....0 4 Coal, "knee deep" 0 4	Lower Kittanning (Gage Coal & Coke Co. Mine, No. 606 on Map IV)	7	1	107	1	107′ 1″
Concealed		35	0	142	1	
Pottsville Series (344′ 5″)						
Sandstone, massive, great cliff, quarry rock, Homewood		50	0	192	1	
Concealed		53	0	245	1	
Sandstone, massive, great pebbly cliff, Upper Connoquenessing		30	0	275	1	
Continued by Coberly No. 1 (105) Coal Test Record (1750′ B.):						
Red surface clay and small boulders		7	4	282	5	
Small pebbled conglomerate rock.15′ 3″ Clay, blue, soft and smooth .... 1 2 Small pebbled conglomerate rock.26 8 Fire clay, soft, light 1 10 Small pebbled conglomerate rock.10 8 Sand rock, fine-grained, gray..13 10	Upper Connoquenessing	69	0	351	5	
Slate, black, Quakertown		2	0	353	5	
Sand rock, hard, gray		0	6	353	11	
Slate, black		1	8	355	7	
Slate, sandy, dark		6	0	361	7	
Coal, Quakertown		0	4	361	11	254′ 10″
Slate, black		1	0	362	11	
Shale, dark-gray		12	0	374	11	
Sandstone, hard, dark, fine-grained ..... 1′ 2″ Sandstone, hard, gray 37 5	Lower Connoquenessing	38	7	413	6	
Slate, sandy, dark		1	10	415	4	
Sandstone, dark		5	0	420	4	
Slate, dark, sandy		2	6	422	10	
Sandstone, gray		0	6	423	4	

	Thickness.		Total.		
	Ft.	In.	Ft.	In.	
Slate, dark, smooth	4	4	427	8	
Slate, black	2	0	429	8	
Slate, dark, sandy	22	11	452	7	
Sandstone, fine, gray	5	9	458	4	
Slate, dark, sandy	7	5	465	9	
Coal, Powellton	1	2	466	11	105′ 0″
Slate, dark, sandy	11	11	478	10	
Coal, Eagle	2	0	480	10	13′ 11″
Fire clay, light, smooth	3	3	484	1	
Sandstone, dark, to bottom	2	5	486	6	

In the following section, made by the writer mostly with hand-level, the Homewood and Upper Connoquenessing Sandstones were observed on the north side of the Tygart Valley River, 0.5 mile southeast of Laurel and the formations below, including the Quakertown Slate horizon were found along the railroad grade 0.3 mile south of Laurel, the great overlying Connoquenessing cliff being followed between the two points. The Lower Kittanning Coal and its interval above the Homewood are inserted from numerous exposures a short distance up the river, the great sandstone cliffs being traced directly to the point where the section was made:

Laurel Section, Leadsville District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (48′)			
Coal, Lower Kittanning, supplied from south side of river	8	8	8′
Interval	40	48	
Pottsville Series (181′)			
Sandstone, massive, **Homewood**	50	98	
Concealed	10	108	
Sandstone, massive, pebbly, **Upper Connoquenessing**	100	208	
Coal, lenticular (0″ to 0′ 4″), Quakertown "Rider"	...	208	200′
Shale, gray	1	209	
Shale, dark, hard	7	216	
Slate, black, with **Lingulae** and **Naladites elongata** fossils, very large and numerous, **Quakertown Slate**	3	219	11′
Shale, sandy, dark	5	224	
Coal (0′ 6″), Quakertown (1780′ B.)	0.5	224.5	
Fire clay shale to grade	4.5	229	

The following section, arranged in descending order, was measured with hand-level by the writer starting at Tygart

Valley River at the mine tipple at Harding and working northeastward up the hill. Owing to the dip of the measures the Quakertown Slate horizon is below drainage at this point:

Harding Section, Leadsville District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (110')			
Concealed with sandstone from top of hill..	80	80	
Coal with partings, Lower Kittanning (1972' L.)............................	13	93	93'
Concealed	17	110	
Pottsville Series (116')			
Sandstone, massive, cliff rock, Homewood...	35	145	
Slate and fire clay.......................	3	148	
Concealed	13	161	68'
Sandstone, massive, pebbly, cliff rock, to Tygart Valley River, Upper Connoquenessing	65	226	

The following section was made with aneroid by Teets and the writer, starting at the southern extremity of Laurel Ridge, 2 miles east of Roaring Creek Junction, and measuring down to the Tygart Valley River just east of the power-house on the Elkins Electric Line. The section exposes the entire Pottsville Series, but owing to the rapid dip the intervals are unreliable and probably shorter than true vertical measurement would show. The Mauch Chunk Reds do not appear at the base of the section on account of the great amount of debris, but they are visible a short distance farther east and, judging by the dip, they should belong above drainage as indicated:

Laurel Ridge Section, Leadsville District.

	Thickness. Feet.	Total. Feet.	
Pottsville Series (505')			
Sandstone, massive, pebbly, capping ridge, Homewood	30	30	
Concealed	15	45	
Sandstone, massive, cliff rock, Upper Connoquenessing	55	100	100'
Concealed	10	110	
Sandstone, massive, cliff rock, with small pebbles, Lower Connoquenessing.......	50	160	
Concealed	153	313	
Shale, dark, with plant fossils, Hartridge..	4	317	

	Thickness. Feet.	Total. Feet.	
Coal, soft, (2' 8"), Sewell (Elkins Electric Railway Co. Mine, No. 1039 on Map IV) (2093' B.)	3	320	220'
Concealed	60	380	
Coal prospect, only a little black slate, Welch	...	380	60'
Concealed	65	445	
Sandstone, massive, pebbly, **Sharon**	25	470	
Concealed	35	505	
Coal digging abandoned, only a little black slate (1905' B.)	...	505	125'
Mauch Chunk Series (35')			
Concealed to Tygart Valley River	35	540	

GENERAL SECTIONS, ROARING CREEK DISTRICT, RANDOLPH.

Roaring Creek District occupies the northwestern corner of the county in the angle formed by Upshur and Barbour, and the same structural features as found in southern Barbour; viz, the Hiram Anticline and Belington Syncline, pass through it. The surface geology is that of the Allegheny and Pottsville Series, the Conemaugh having entirely disappeared with the southern rise of the rocks.

The following section was measured with aneroid by Teets, starting at the top of the hill one-half mile south of Findley and working northward to the Tygart Valley River near the mouth of Little Laurel Run, the intervals being larger than true vertical measurement would show, owing to the northward dip:

Findley Section, Roaring Creek District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (175')			
Sandstone, massive, **Lower Freeport**	25	25	
Concealed	25	50	
Bench	5	55	
Concealed	59	114	
Slate	2	116	
Coal ....0' 10" Slate, black..3 2 **Coal** ....1 0 Slate, black..1 8 **Coal** ....2 4 **Lower Kittanning** (2085' B.) (Mine, No. 796 on Map IV)	9	125	125'
Sandstone and concealed	25	150	
Concealed	25	175	
Pottsville Series (280')			
Concealed	35	210	

		Thickness. Feet.	Total. Feet.	
Sandstone, massive, Homewood		30	240	
Slate, with coal streaks, Upper Mercer		13	253	128'
Sandstone		12	265	
Slate, black		13	278	
Coal, Lower Mercer.		2	280	
Sandstone, massive 45'	Upper Connoquenessing	95	375	122'
Concealed 20				
Sandstone, massive 30				
Concealed to bed of Tygart Valley River (1755' B.)		80	455	

The following section was measured with aneroid by Teets just southeast of Leiter:

Leiter Section, Roaring Creek District.

		Thickness. Feet.	Total. Feet.	
Allegheny Series (160')				
Concealed		40	40	
Sandstone, massive, pebbly, Lower Freeport		15	55	
Concealed		5	60	
Prospect opening (no coal in sight), Upper Kittanning		5	65	65'
Concealed		83	148	
Slate		2	150	
Coal 1' 6"	(9' 9") Clarion (2025' B.) (Davis Coal & Coke Co. Leiter Mine, No. 834 on Map IV)	10	160	95
Slate, black 0 10				
Coal 1 2				
Slate, bony 0 8				
Coal 0 1				
Slate, dark 0 9				
Coal 2 8				
Shale, gray 0 10				
Coal, soft (visible) 1 3				
Pottsville Series (115')				
Slate and concealed		40	200	
Sandstone and concealed, Homewood		75	275	

In the following section the surface portion was measured with aneroid by Teets and the writer, starting at the top of the hill just west of Roaring Creek Junction and working eastward to the Tygart Valley River at the Junction. The lower portion is the record of the Wm. Corley No. 9 (108) Coal Test, drilled by the Davis Colliery Company, and located within a few yards of the railroad station, John T. Davis, of Elkins, Vice-President of the company, being authority for the data. The section probably extends very near to the base of the Pottsville:

Roaring Creek Junction Section, Roaring Creek District.

		Thickness. Ft.	Thickness. In.	Total. Ft.	Total. In.	
Allegheny Series (87')						
Concealed from top of hill........		45	0	45	0	
Coal ....1' 1"	Lower Kittanning (2030' B.) (Davis Colliery Co. Mine No. 5 Coaling Station, No. 803 on Map IV)	6	7	51	7	51' 7"
Slate, bony....0 5						
Coal, soft, columnar..2 8						
Slate, dark....0 9						
Coal, soft.....1 8						
Concealed		35	5	87	0	
Pottsville Series (612' 7")						
Sandstone, massive, Homewood...		30	0	117	0	
Concealed		60	0	177	0	
Sandstone, massive, pebbly, Upper Connoquenessing		47	0	224	0	
Continued by Wm. Corley No. 9 (108) Coal Test Record (1858' L.):						
Surface		9	6	233	6	
Fire clay........................		15	8	249	2	
Sandstone, gray, Lower Connoquenessing		22	5	271	7	
Shale, green, and fire clay.........		21	3	292	10	
Sandstone, gray................		12	7	305	5	
Shale, green....................		41	10	347	3	
Sandstone, gray................		6	4	353	7	
Fire clay.......................		6	7	360	2	
Coal, slate and sulphur, Campbell Creek		0	7	360	9	309' 2"
Fire clay and sandstone, mixed...		12	6	373	3	
Sandstone, gray................		21	11	395	2	
Sandy slate.....................		8	8	403	10	
Coal ....0' 2"	Powellton	2	8½	406	6½	45' 9½"
Slate and sand.1 0						
Coal 1 6½						
Sand slate......................		5	10½	412	5	
Sandstone and slate, mixed.......		5	9	418	2	
Sandstone, gray.................		18	4	436	6	
Slate and fire clay..............		2	4½	438	10½	
Coal, Eagle.....................		0	3½	439	2	32' 7½"
Sandstone and sand slate, mixed..		9	9	448	11	
Sandstone, gray, Decota..........		23	5	472	4	
Slate		10	0	482	4	
Coal and slate, mixed, Gilbert.....		1	1	483	5	44' 3"
Fire clay and green shale, mixed..		7	11	491	4	
Slate, streak sandstone..........		10	10½	502	2½	
Coal, Hughes Ferry..............		5	3½	507	6	24' 1"
Fire clay, sand slate and slate mixed		10	10½	518	4½	
Coal ....0' 1½"	Castle...	2	8½	521	1	13' 7"
Slate 0 3½						
Coal, bony.....0 1½						
Coal 2 2						
Slate and fire clay...............		25	9	546	10	

		Thickness. Ft.	In.	Total. Ft.	In.	
Sandstone, gray, Lower Guyandot?		23	3	570	1	
Coal, bony........0′ 2½″ Slate, and little coal ....0 5½ Coal, little slate and sulphur...1 4 Slate and bony coal 0 8½	Sewell	2	8½	572	9½	51′ 8½″
Fire clay........................		7	1½	579	11	
Clay		1	1	581	0	
Coal, bony, Welch................		0	10	581	10	
Slate and fire clay..............		2	4	584	2	
Sandstone, gray..................		13	2	597	4	
Coal		0	2	597	6	
Sandstone, gray ....36′ 4″ Sandstone, gray and conglomerate .... 3 2 Sandstone, gray 34 1	Sharon Conglomerate..	73	7	671	1	98′ 3½″
Slate, black, and little seams of coal		3	5	674	6	
Fire clay and gray sandstone, mixed		3	9	678	3	
Sandstone, gray, and conglomerate		20	4	698	7	
Sandstone and sand slate, mixed, to bottom....................		1	0	699	7	

The following section was measured with aneroid by the writer, starting at the top of the hill south of Laurel Creek, at a point 1.5 miles west of Pumpkintown and working northward to the Parkersburg and Staunton Turnpike at the "Half-Way House":

Pumpkintown Section, Roaring Creek District.

		Thickness. Feet.	Total. Feet.	
Allegheny Series (75′)				
Sandstone, massive, capping ridge, East Lynn		45	45	
Concealed		30	75	75
Pottsville Series (342′)				
Sandstone, massive, partly concealed in bluff, Homewood.....................		55	130	
Coal ......0′ 6″ Slate, dark.0 2 Coal ......0 8 Slate, dark.0 2 Coal, soft...1 3 Shale, gray.1 0 Coal 1 6	(5′ 3″) Upper Mercer (2380′ B.) (Pat Ford Mine, No. 860 on Map IV)	5	135	60
Concealed in bench......................		5	140	

	Thickness. Feet.	Total. Feet.	
Sandstone, partly concealed in bluff, Upper Connoquenessing	135	275	
Bench, contains coal ½ mile farther east, Quakertown	10	285	150'
Concealed to run	130	415	
Coal, exposed on Rafferty farm, ½ mile westward, Campbell Creek, thickness supplied	2	417	132'

GENERAL SECTIONS, MIDDLE FORK DISTRICT, RANDOLPH.

Middle Fork District occupies a large area lying between Rich Mountain on the east and Upshur and Webster Counties on the west, being more than twenty miles long. Its surface geology is almost entirely that of the Pottsville Series as the Allegheny only caps some of the highest hills along the Upshur Line. At the southern end of the District, the Mauch Chunk is exposed along the Back Fork of Elk and it also comes to the surface where the Hiram Anticline crosses the Middle Fork River below Cassity and where it crosses Left Fork of Buckhannon River in the Hartridge region.

The following section was measured with aneroid by Teets, starting at the top of the mountain 1.5 miles northwest of Cassity and descending southwestward to the Middle Fork River one-third mile southeast of the mouth of Lost Run Since this point is just east of where the Hiram Anticline crosses the river, the top of the Mauch Chunk is exposed in the base of the section:

Lost Run of Middle Fork Section, Middle Fork District.

	Thickness. Feet.	Total. Feet.	
Pottsville Series (795')			
Concealed	10	10	
Sandstone, massive, pebbly, Upper Connoquenessing	50	60	60
Concealed	150	210	
Bench, concealed	5	215	
Concealed	170	385	
Bench, concealed	5	390	
Concealed	35	425	
Bench, concealed	5	430	
Concealed	95	525	
Bench, concealed	5	530	
Concealed	105	635	

	Thickness. Feet.	Total. Feet.	
Bench, concealed	5	640	
Concealed	27	667	
Coal, Sewell (2115' B.)	3	670	610'
Concealed	20	690	
Sandstone, **Sharon**	35	725	
Concealed	70	795	125'
Mauch Chunk Series (25')			
Shales, red and variegated, to Middle Fork River	25	820	

The following section was measured with aneroid by Tetes, 0.7 mile northwest of Cassity and just west of Lick Run, tributary to Middle Fork:

Lick Run of Middle Fork Section, Middle Fork District.

	Thickness. Feet.	Total. Feet.
Pottsville Series (705')		
Concealed	15	15
Sandstone, massive, conglomerate, **Upper Connoquenessing**	89	104
Coal blossom, Quakertown	1	105
Concealed	225	330
Sandstone, massive	60	390
Concealed	89	479
Coal blossom, Hughes Ferry	1	480
Concealed	172	652
Coal, Sewell, (2040' B.)	3	655
Concealed	15	670
Shale, gray, slaty	10	680
Sandstone, massive, to Middle Fork River	25	705

In the following section, arranged in descending order, the surface portion was measured with hand-level, starting with the Middle Fork River at Cassity and working westward to the top of Bear Knob, due acknowledgment being made to R. O. Zirkle, a pioneer resident of Cassity, who pointed out the coal prospects, some of which were in the woods and could not otherwise have been found. The lower portion is the record of the Andrew Currence Coal Test No. 11 (114), drilled by the Davis and Elkins interests, to which the Davis Colliery Company is now the successor, and located on Threeforks Run, 0.8 mile southwest of Cassity, and previously published by Dr. White in Volume II, page 623, of the Survey. The base of the measured section is cut off so as to make a continuous stratigraphic sequence with the coal test, the presence of the Sewell Coal at both points making a good "key-rock" for joining the two measurements:

Cassity Section, Middle Fork District.

	Thickness. Ft.	In.	Total. Ft.	In.	
Pottsville Series (915' 10½")					
Sandstone, capping Bear Knob, Homewood (top, 2807' L.)	40	0	40	0	
Concealed	60	0	100	0	
Sandstone, massive, pebbly at top, cliff rock, Upper Connoquenessing	100	0	200	0	
Slate, black, thickness concealed, (one large Naiadites fossil found), Quakertown Slate	..	..	200	0	200' 0"
Coal, Quakertown (2606' L.), reported	0	8	200	8	
Concealed	144	4	345	0	
Coal, Campbell Creek (2461' L.)	0	7	345	7	145' 7"
Concealed	85	5	431	0	
Slate, black	1	0	432	0	
Coal (2375' L.)	0	4	432	4	
Concealed	8	8	441	0	
Coal ...1' 0" Slate, dark 0 7 Coal ....2 2 } Eagle (Frank Phares Prospect No. 990B on Map IV)	3	9	444	9	99' 2"
Concealed in steep bluff	82	3	527	0	
Coal (2279' L.) reported	1	0	528	0	
Concealed	15	0	543	0	
Coal, Gilbert (2263' L.), visible	1	0	544	0	99' 3"
Concealed	47	6	591	6	
Coal, Hughes Ferry (2215' L.), reported	0	6	592	0	48' 0"
Concealed	30	0	622	0	
Slate, black	3	0	625	0	
Coal opening (Jack Long Mine, No. 1034 on Map IV), (2180' L.) Castle, 1' visible, reported 2' 4" to	2	0	627	0	35' 0"
Sandstone, massive, Guyandot	25	0	652	0	
Concealed	35	0	687	0	
Shale, sandy	3	6	690	6	
Coal, Sewell "B" (2116' L.)	0	6	691	0	64' 0"
Sandstone, shaly	5	0	696	0	
Concealed	43	0	739	0	
Continued by record of Andrew Currence Coal Test No. 11 (114) (2092' B.):					
Surface boulders and sand	6	3	745	3	
Fire clay, broken up, soft	2	9	748	0	
Coal ....2' 2" Coal and slate mixed ....1 0 } Sewell	3	2	751	2	60' 2"

	Thickness.		Total.		
	Ft.	In.	Ft.	In.	
Fire clay, broken up	18	0	769	2	
Fire clay, little streaks of gray sandstone	11	0	780	2	
Slate and fire clay	3	2	783	4	
Fire clay and gray sandstone, mixed	23	9	807	1	
Slate, sandy	11	11	819	0	
Sandstone, gray, with streaks of slate	10	8	829	8	
Slate, sandy	2	8	832	4	
Sandstone, gray	6	11	839	3	
Slate, sandy	2	8	841	11	
Sandstone, gray	11	0	852	11	
Fire clay and slate, mixed, and trace of coal	23	8	876	7	
Bone coal	0	2½	876	9½	125' 7½"
Fire clay	8	0	884	9½	
Bone and coal, mixed, streaks of slate	1	9	886	6½	
Slate	2	5	888	11½	
Sandstone, gray ....15' 7"					
Conglomerate, very coarse... 0 6					
Slate, sandy.. 1 2					
Sandstone, gray..... 0 5					
Conglomerate, coarse... 1 0					
Sandstone, gray..... 5 8					
Conglomerate, coarse... 2 7					
Sharon Conglomerate	26	11	915	10½	39' 1"
Mauch Chunk Series (118' 11")					
Slate, sandy	2	9	918	7½	
Green sandstone and shale	58	9	977	4½	
Sandstone, gray	43	1	1020	5½	
Fire clay, greenish cast	9	9	1029	5½	
Gray sandstone to red beds	5	4	1034	9½	

In the above section the lower 119 feet of strata are placed in the Mauch Chunk because that interpretation coincides more nearly with the facts as shown by the Lost Run Section on pages 168-9, where the base of the Pottsville is only 125 feet below the Sewell Coal, the identity of which is not subject to question in either section, and also because the great Sharon Conglomerate noted in the section was frequently observed at many points just overlying the red beds, and even in the record above the lithologic change from gray conglomerate to green shales and sandstones, typical of the Mauch Chunk, is abrupt.

The following section was measured with aneroid by Teets and the writer descending the steep hill road on Cassity Fork. 2 miles northeast of Cassity:

Cassity Fork Section, Middle Fork District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (')			
Coal blossom, Lower Kittanning (2525' B.)...			
Pottsville Series (336')			
Sandstone, massive, great cliff, **Homewood**	40	40	
Concealed	15	55	
Coal blossom, Upper Mercer (2470' B.)	...	55	55'
Concealed	35	90	
Sandstone, massive, cliff rock, **Upper Connoquenessing**	80	170	
Coal blossom, Quakertown (2355' B.)	...	170	115'
Concealed and fire clay	25	195	
Coal blossom, streak (2330' B.)	...	195	25'
Fire clay and concealed	25	220	
Slate, black (2300' B.)	...	220	
Shale, sandy, and concealed	75	295	
Slate, black, hard, laminated	4	299	
Coal, good (1' 0"), Campbell Creek (2220' B.)	1	300	105'
Fire clay	2	302	
Sandstone, hard	2	304	
Shale, sandy, with limestone nuggets	11	315	
Coal (0 4"), (2205' B.)	...	315	15'
Shale, dark	4	319	
Sandstone, massive	6	325	
Coal (0' 7"), **Powellton** (2194' B.)	1	326	11'
Shale, dark, sandy, with limestone nuggets	8	334	
Sandstone to creek	2	336	

In the following section, arranged in descending order, the upper portion was measured with aneroid by Teets, starting at the top of the mountain west of Middle Fork River and descending eastward to the mouth of Laurel Branch, 2 miles northeast of Adolph, the John Fincham mine on the east side being inserted at its proper place. The lower portion is the record of the John Fincham No. 14 Coal Test (116), located at the mouth of Laurel Branch, and drilled by the Davis Colliery Company. This record was previously published by Dr. White in Volume II, page 624, of the Survey. The same absence of red rock at the top of the Mauch Chunk is noted here as that found at Cassity but the great Beech (Sharon) Conglomerate is present, 81 feet thick, and seems to mark the base of the Pottsville as the rocks underlying it change suddenly to shales and green sandstones:

Laurel Branch of Middle Fork Section, Middle Fork District.

	Thickness. Ft.	In.	Total. Ft.	In.	
Pottsville Series (818' 5")					
Sandstone, massive, Upper Connoquenessing	30	0	30	0	30' 0"
Concealed and sandstone	25	0	55	0	
Sandstone, massive, Lower Connoquenessing	30	0	85	0	
Concealed	35	0	120	0	
Sandstone, and concealed (mostly sandstone)	25	0	145	0	
Bench, concealed	5	0	150	0	
Concealed and sandy shale	70	0	220	0	
Bench, concealed	5	0	225	0	
Concealed	79	6	304	6	
Slate, gray	0	6	305	0	
Coal, Campbell Creek (No. 2 Gas), (John Fincham Mine, No. 947 on Map IV)	2	6	307	6	277' 6"
Concealed	62	6	370	0	
Bench, concealed	5	0	375	0	
Concealed	75	0	450	0	
Sandstone and sandy shale	30	0	480	0	
Concealed	23	0	503	0	
Slate, black, Hughes Ferry Coal horizon	2	0	505	0	197' 6"
Sandstone, flaggy	28	0	533	0	
Slate, black, to top of coal test	13	0	546	0	
Continued by John Fincham No. 14 (116) Coal Test Record (2214' L.):					
Surface clay, sand, and boulders	4	2	550	2	
Sandstone, gray, streaks of slate	7	6	557	8	
Slate, little streaks of sandstone	12	0	569	8	
Fire clay	2	11	572	7	
Slate and fire clay	0	10	573	5	
Coal, Castle	1	0	574	5	69' 5"
Fire clay, broken up, very soft	12	10	587	3	
Sandstone, gray, and fire clay, mixed	10	7	597	10	
Slate and fire clay, mixed	4	7	602	5	
Fire clay	1	10	604	3	
Sandstone, gray, Guyandot	23	6	627	9	
Slate	26	7	654	4	
Coal and slate, mixed, Sewell "B".	1	8	656	0	81' 5"
Fire clay	6	6	662	6	
Sandstone, gray	34	3	696	9	

		Thickness. Ft.	In.	Total. Ft.	In.	
Sandstone, gray, and pea conglomerate, mixed, very hard ....12′ 9″	Lower Guyandot	16	9	713	6	
Conglomerate, pea, very hard...... 4 0						
Coal ....0′ 2″	Sewell	2	1	715	7	59′ 7″
Conglomerate, pea, very hard......1 9						
Coal 0 2						
Conglomerate, pea, very hard......		0	4	715	11	
Sandstone, fine-grained, very hard		7	9	723	8	
Sandstone, gray..................		4	3	727	11	
Slate, fire clay, sandstone, broken up		9	6	737	5	
Sandstone, gray, broken up, very hard...11′ 0″	Sharon Conglomerate	81	0	818	5	102′ 10″
Sandstone, gray, full of spots of fire clay, sulphur 3 10						
Sandstone, gray.19 0						
Conglomerate ... 4 3						
Sandstone, gray, and streaks of slate..... 4 10						
Sandstone, gray.38 1						
Mauch Chunk Series (107′ 3″)						
Slate, sandy, and fire clay........		13	3	831	8	
Fire clay.......................		3	6	835	2	
Fire clay and green shale, mixed..		5	11	841	1	
Fire clay, very soft..............		1	0	848	1	
Fire clay and green shale, mixed..		5	0	853	1	
Fire clay and streaks of green sandstone		13	6	866	7	
Sandstone, gray..................		9	1	875	8	
Sandstone, gray, mixed...........		14	2	889	10	
Conglomerate and sandstone, mixed		3	5	893	3	
Sandstone, gray, spots of conglomerate		28	6	921	9	
Fire clay and sandstone, mixed, to red beds.....................		3	11	925	8	

In the following section, arranged in descending order, the surface portion was measured with aneroid, starting at the top of the mountain 1.3 miles north of Adolph and descending southeastward to Middle Fork River at the mouth of Schoolcraft Run. The lower portion is the record of the K. E. Zickefoose No. 13 (117) Coal Test, located in Adolph and drilled by the Davis Colliery Company. This record was previously published by Dr. White in Volume II, page 625 of the Survey. The boring probably ends just at the base of the Pottsville, although no soft Mauch Chunk Shales are noted:

Adolph Section, Middle Fork District.

	Thickness. Ft.	In.	Total. Ft.	In.	
Pottsville Series (855' 11")					
Sandstone, massive (15' visible), and concealed, in bluff, **Upper Connoquenessing**	75	0	75	0	75' 0"
Bench	....	..	75	0	
Steep bluff	70	0	145	0	
Bench	5	0	150	0	
Steep bluff	125	0	275	0	
Bench	5	0	280	0	
Concealed in bluff	85	0	365	0	
Coal prospect, fallen shut, mostly black slate, Eagle (2415' B.)	....	..	365	0	290' 0"
Concealed	125	0	490	0	
Slate, black	4	8	494	8	
Coal, Gilbert (2295' B.)	1	4	496	0	130' 0"
Sandstone and concealed to stratigraphic level of boring	39	0	535	0	
Continued by K. E. Zickefoose No. 13 (117) Coal Test Record (2323' L.):					
Surface, boulders, and sand	7	7	542	7	
Slate and little seams of gray sandstone	7	1	549	8	
Coal, Hughes Ferry	1	7	551	3	56' 3"
Slate	13	11	565	2	
Sandstone, gray, broken ....14' 8" Sandstone, gray....17 10 } **Middle Iaeger**	32	6	597	8	
Slate, fire clay, spots of gray sandstone	5	6	603	2	
Slate	17	1	620	3	
Sandstone, gray, streaks of slate, **Harvey**	14	9	635	0	
Fire clay and slate	3	4	638	4	
Coal ....1' 0 " Slate ....0 7½ **Coal,** bony........0 4½ } **Castle.**	2	0	640	4	89' 1"
Fire clay, very soft, broken	10	3	650	7	
Sandstone, dark, and fire clay	5	8	656	3	
Sandstone, dark-gray	25	10	682	1	
Slate and fire clay	12	8	694	9	
Sandstone, gray, and streaks of slate, **Guyandot**	10	9	705	6	
Slate and bony coal, Sewell "B"	0	4½	705	10½	65' 6½"
Fire clay, very sandy	5	8½	711	7	
Fire clay and slate	15	2	726	9	

				Thickness. Ft.	In.	Total. Ft.	In.	
Sandstone, gray, Lower Guyandot				16	6	743	3	
Sandstone, gray, and little trace of coal				6	8	749	11	
Fire clay				5	8	755	7	
Coal, slaty, Sewell				2	7	758	2	52′ 4½″
Fire clay				8	5	766	7	
Sandstone, gray	29′	6″	Sharon Conglomerate	89	4	855	11	
Slate and streaks of gray sandstone	2	7						
Sandstone, gray, and streaks of slate	21	8						
Slate	4	2						
Slate and sandstone, mixed	4	2						
Sandstone, gray, and streaks of slate, mixed	3	5						
Sandstone, gray, very hard, to bottom	23	10						

The following section was measured with aneroid starting at the Big Laurel Thicket and working eastward down the mountain to the Middle Fork River at the last settlement 2.5 miles south of Adolph:

Big Laurel Thicket Section, Middle Fork District.

Pottsville Series (540′)				Thickness. Feet.	Total. Feet.	
Sandstone, massive, pebbly, cliff rock, Upper Connoquenessing				70	70	70′
Concealed in bench				5	75	
Steep bluff, with sandstone				65	140	
Spring				...	140	
Concealed				253	393	
Sandstone, shaly, **Eagle**				4.5	397.5	
Coal, soft, columnar	2′	0″	**Eagle (2675′ B.) (Simeon Kittle Mine, No. 992A on Map IV)**	2.5	400	380′
Slate, dark	0	2				
Coal	0	4				
Concealed				49	449	
Coal, (2625′ B.), reported				1	450	50′
Concealed				64	514	
Coal, Gilbert, (2560′ B.), (reported 0′ 10″)				1	515	65′
Concealed				23	538	
Coal, in river, Hughes Ferry, (2535′ B.), (reported, 1′ 8″)				2	540	25′

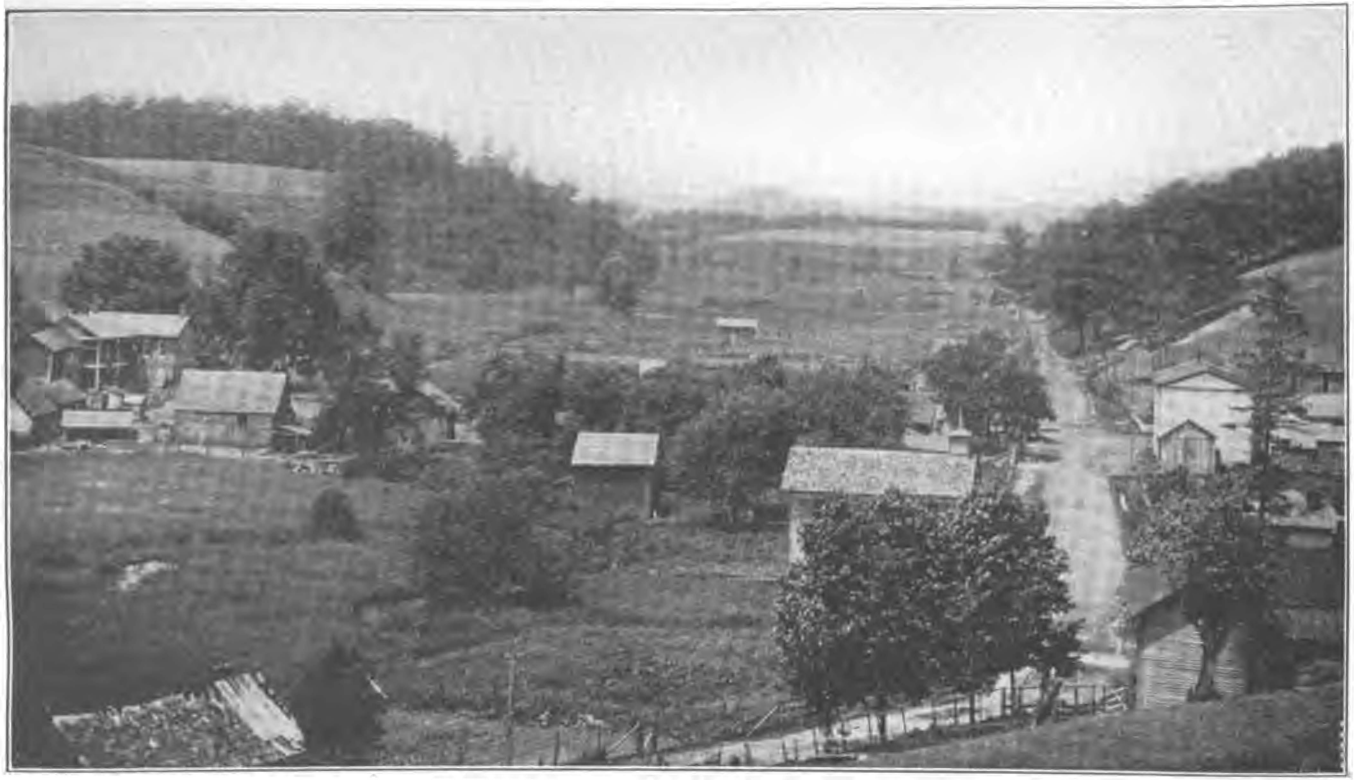

PLATE XI.—View at Meadowville looking north and showing low hills made by the soft shales of the Upper Conemaugh Series along the axis of the Belington Syncline.

	Thickness.		Total.		
	Ft.	In.	Ft.	In.	
Shale	12	2	606	2	
Coal, Sewell	2	4	608	6	37′ 1″
Shale, dark	34	8	643	2	
Mauch Chunk Series (42′)	....				
Shale, red	10	0	653	2	
Shale, dark	6	0	659	2	
Sandstone	20	0	679	2	
Shale, red and green	6	0	685	2	

The following section was measured with aneroid by Teets, starting on the hill 0.6 mile west of Czar, and descending the road to Left Fork of Right Fork of Buckhannon River at Czar. Owing to the eastward rise of the rocks, the intervals are slightly less than true vertical measurement would show:

Czar Section, Middle Fork District.

	Thickness.	Total.	
Pottsville Series (445′)	Feet.	Feet.	
Concealed	25	25	
Sandstone, gray, flaggy	35	60	
Shale, sandy	5	65	
Sandstone, massive, coarse-grained	35	100	
Shale, sandy, and sandstone	39	139	
Coal blossom, Alma (2475′ B.)	1	140	140′
Shale, gray, sandy	45	185	
Sandstone	5	190	
Shale, sandy, gray	19.5	209.5	
Coal blossom, Campbell Creek (2405′ B.)	0.5	210	70′
Shale, sandy, and concealed	37	247	
Fire clay	3	250	
Shale, sandy	35	285	
Sandstone, massive, medium-grained, **Eagle**	50	335	
Shale and slate, **Newlon**	18.5	353.5	
Coal, Eagle, (2245′ B.)	1.5	355	145′
Shale, sandy, and concealed	75	430	
Sandstone, massive, fine-grained	8	438	
Slate, dark, to bottom	7	445	

The following section was measured with aneroid by Teets, starting at the top of the hill 1 mile south of Czar and working eastward to the forks of Trout Run:

Trout Run Section, Middle Fork District.

	Thickness. Feet.	Total. Feet.	
Pottsville Series (550')			
Sandstone, massive, **Upper Connoquenessing**	20	20	20'
Concealed	80	100	
Sandstone and concealed, bluff	20	120	
Concealed	80	200	
Bench, concealed	5	205	
Concealed	95	300	
Slate	5	305	
Coal, soft..1' 6" Slate, gray.0 6 **Coal,** soft..3 0 } **Alma** (2570' B.) (reported section) (J. J. Wuerzer opening, No. 912A on Map IV)	5	310	290'
Concealed and sandstone	135	445	
Slate, black	2.5	447.5	
Coal, bony.0' 4" **Coal,** soft..2 2 } **Eagle** (2' 6") (J. J. Wuerzer opening No. 997 on Map IV)	2.5	450	140'
Concealed to run	100	550	

The following section was measured with aneroid by Teets, starting at the top of the hill 1 mile southwest of Helvetia and descending the road northeastward to that village:

Helvetia Section, Middle Fork District.

	Thickness. Feet.	Total. Feet.	
Pottsville Series (535')			
Shale, sandy	65	65	
Bench, concealed	5	70	
Sandstone, and sandy shale	35	105	
Sandstone, massive cliff, gray, medium-grained	20	125	
Bench, concealed	10	135	
Shale, sandy, and concealed	40	175	
Bench, sandy shale	5	180	
Shale. sandy, and concealed	40	175	
Bench, concealed	10	230	
Shale, sandy, and sandstone	85	315	
Bench, concealed	5	320	
Shale, sandy and concealed	30	350	
Bench, shale, sandy	5	355	
Shale, sandy, and sandstone	50	405	
Bench, concealed, and sandy shale	10	415	
Shale, sandy, and sandstone	55	470	
Concealed, bench	5	475	
Shale, slaty, dark	34	509	
Coal blossom, Castle, (2265' B.)	1	510	510'
Concealed and sandy shale, to run	25	535	

The following section was measured with aneroid by Teets, starting at the common corner of Upshur, Randolph, and Webster, and working eastward down Devil Run to Arvondale Junction. Owing to the southeastward rise of the rocks, the intervals are shorter than true vertical measurement would show:

Arvondale Junction Section, Middle Fork District.

	Thickness. Feet.	Total. Feet.	
Allegheny Series (70')			
Concealed	30	30	
Shale, sandy, and concealed	20	50	
Slate, black	3.5	53.5	
Coal, soft........1' 3" Coal, bony and slaty........2 3 Coal, soft........3 0 **Lower Kittanning** (6' 6") (2730' B.) (D. S. Thomas Mine)	6.5	60	60'
Shale and concealed	10	70	
Pottsville Series (420')			
Sandstone, massive, pebbly, **Homewood**	20	90	
Shale and concealed	15	105	
Concealed, bench	5	110	
Shale, sandy, and concealed	40	150	
Bench, concealed	5	155	
Shale, sandy, and sandstone, **Upper Connoquenessing**	40	195	135'
Shale, sandy, and concealed	40	235	
Sandstone	15	250	
Shale, sandy, and sandstone	15	265	
Sandstone, flaggy	15	280	
Shale, sandy, and concealed	35	315	
Concealed, bench	10	325	
Shale, sandy, and sandstone	40	365	
Concealed	10	375	
Sandstone	20	395	
Shale, sandy, and concealed	50	445	
Sandstone, massive, medium-grained	30	475	
Slate, dark, cannelly, with Lingulae fossils, near top, Newlon	12	487	292'
Sandstone to run (2300' B.)	3	490	

The following section was measured with aneroid by Teets and the writer, starting at the sand quarry one-half mile southeast of Silica and working westward to the Right Fork of the Buckhannon River, the two McCauley mines which are located just north of the village being inserted at their proper geologic horizons:

Silica Section, Middle Fork District.

	Thickness. Feet.	Total. Feet.	
Pottsville Series (580')			
Sandstone, massive, coarse, soft, pebbly, quarry rock, **Homewood**	40	40	
Concealed and shale	3	43	
Coal, soft, columnar, **Upper Mercer** (J. A. McCauley Mine, No. 863 on Map IV) (3' 4")	3	46	46'
Concealed	24	70	
Sandstone, massive, **Upper Connoquenessing**	15	85	
Concealed	70	155	
Coal, prospect, thickness concealed, **Quakertown**	...	155	109'
Concealed	136	291	
Shale, sandy, dark	7	298	
Concealed	120	418	
Coal, splinty (2' 2"), (R. T. McCauley Mine, No. 956 on Map IV), **Campbell Creek**	2	420	265'
Concealed	80	500	
Sandstone, massive, **Eagle**	60	560	
Slate, black, sandy, to river, **Newlon**	16	576	
Coal, reported in river, **Eagle** (2360' B.) (Prospect No. 1001 on Map IV)	4	580	160'

GENERAL SECTIONS, MINGO DISTRICT, RANDOLPH.

Mingo District lies south of Middle Fork and next to Webster County, at the southern extremity of the territory of this Report. The surface rocks are principally those of the Pottsville Series, but the different branches of Elk River have cut down into the underlying Mauch Chunk and Greenbrier.

The following section was measured with aneroid, starting at the top of Point Mountain, 1.9 miles east of Waneta and descending the trail to the mouth of Mill Run of Elk River, 1 mile southwest of Samp:

Samp Section, Fork Lick District, Webster.

	Thickness. Feet.	Total. Feet.
Pottsville Series (800')		
Concealed from top of Point Mountain	460	460
Sandstone, massive, cliff rock, partly concealed (3085' B.)	55	515
Concealed (2800' B.)	285	800
Mauch Chunk Series (630')		
Red shale, partly concealed	290	1090
Sandstone, flaggy, fine, partly concealed	125	1215
Concealed with reds	215	1430
Greenbrier Limestone (60')		
Limestone, Greenbrier, to Elk River	60	1490

The following section was made with aneroid, starting at the top of a spur of Point Mountain 1.2 miles southeast of Waneta and working northwestward toward Big Run, acknowledgment being due to Lee Hamrick, who pointed out the various coal prospects which probably would not otherwise have been found as the ground was covered with snow a foot or more in depth:

Waneta Section, Fork Lick District, Webster.

	Thickness. Feet.	Total. Feet.	
Pottsville Series (725')			
Concealed from top of ridge	45	45	
Coal, soft, columnar, (1' 8"), **Campbell Creek** (?), (3635' B.) (Lee A. Hamrick Prospect)	2	47	47'
Concealed	228	275	
Sandstone, massive, with small pebbles, **Lower Nuttall**	65	340	
Coal, Hughes Ferry (3340' B.) reported	...	340	293'
Concealed	154.5	494.5	
Sandstone, massive, **Guyandot**	25	519.5	
Shale, dark	2	521.5	
Shale, gray	1	522.5	
Coal, soft..2' 2" Bony splint.0 1 **Coal**, hard..0 3 **Sewell "B"** (3155' B.) (Jacob Fisher Prospect)	2.5	525	185'
Concealed	30	555	
Sandstone, massive, **Lower Guyandot**	15	570	
Shale	1	571	
Coal, hard, blocky, **Sewell** (3105' B.) (Jacob Fisher Prospect)	4	575	50'
Sandstone, massive, **Welch**	24	599	
Coal, Welch, (3080' B.), reported	1	600	25'
Sandstone, massive, **Sharon (Raleigh)**	75	675	
Shale, greenish-gray	30	705	
Sandstone, massive, coarse (2955' B.)	20	725	
Mauch Chunk Series			
Shale, red	...	....	

SUMMARY.

For convenience of reference, the thickness of the stratified rocks in Barbour, Upshur, and the western portion of Randolph, as determined by the sections in this Chapter, is compiled in the following table, showing not only the thickness of the various series but also the totals for the Pennsylvanian, Mississippian, and Devonian Rocks down to the

Table Showing Thickness in Feet of Stratified Rocks in Barbour, Upshur, and Western Randolph Counties.

Place Measured.	~~Mississippian.~~ Pennsylvanian,						~~Pennsylvanian.~~ Mississippian,				Devonian.		
	Dunkard.	Monongahela.	Conemaugh.	Allegheny.	Pottsville.	Total.	Mauch Chunk.	Greenbrier Limestone.	Pocono Sandstones.	Total.	Catskill.	Chemung.	Total.
Adma	.....	.....	80	270	246	596	.....	.....	.....	.....	.....	.....	.....
Adolph	.....	.....	.....	.....	856	856	.....	.....	.....	.....	.....	.....	.....
Alexander	.....	.....	.....	100	270	370	.....	.....	.....	.....	.....	.....	.....
Arden	.....	.....	82	230	90	402	.....	.....	.....	.....	.....	.....	.....
Arlington	.....	.....	99	224	132	455	.....	.....	.....	.....	.....	.....	.....
Arnold Run	105	405	15	.....	.....	525	.....	.....	.....	.....	.....	.....	.....
Arvondale Junction	.....	.....	.....	70	420	490	.....	.....	.....	.....	.....	.....	.....
Astor	.....	250	630	(?)	(?)	1440	260	75	415	750	115	.....	115
Audra	.....	.....	.....	220	55	275	.....	.....	.....	.....	.....	.....	.....
Beans Mill	.....	.....	.....	70	175	245	.....	.....	.....	.....	.....	.....	.....
Bear Knob	196	358	571	230	509	1907	310	77	302	689	(?)	(?)	756
Beech Lick	.....	385	210	.....	.....	595	.....	.....	.....	.....	.....	.....	.....
Belington	.....	10	567	213	4	794	.....	.....	.....	.....	.....	.....	.....
Berryburg	.....	400	5	.....	.....	405	.....	.....	.....	.....	.....	.....	.....
Berryburg Junction	.....	.....	170	181	.....	351	.....	.....	.....	.....	.....	.....	.....
Big Laurel Thicket	.....	.....	.....	.....	540	540	.....	.....	.....	.....	.....	.....	.....
Big Run	.....	385	85	.....	.....	470	.....	.....	.....	.....	.....	.....	.....
Buckhannon	.....	.....	610	190	.....	800	.....	.....	.....	.....	.....	.....	.....
Canaan	.....	.....	.....	110	190	300	.....	.....	.....	.....	.....	.....	.....
Cassity	.....	.....	.....	.....	916	916	119	.....	.....	119	.....	.....	.....
Cassity Fork	.....	.....	.....	.....	336	336	.....	.....	.....	.....	.....	.....	.....
Century	55	395	590	220	502	1762	123	55	325	503	695	340	1035
Charity Fork	.....	360	20	.....	.....	380	.....	.....	.....	.....	.....	.....	.....
Clements	.....	.....	97	225	196	518	.....	.....	.....	.....	.....	.....	.....

Table Showing Thickness in Feet of Stratified Rocks in Barbour, Upshur, and Western Randolph Counties (Continued).

Place Measured.	[redacted] Pennsylvanian.						[redacted] Mississippian.				Devonian.		
	Dunkard.	Monongahela.	Conemaugh.	Allegheny.	Pottsville.	Total.	Mauch Chunk.	Greenbrier Limestone.	Pocono Sandstones.	Total.	Catskill.	Chemung.	Total.
Cleveland	......	......	100	260	618	978	802	165	425	1392	257	......	25
Colebank	......	20	633	186	99	938	......	......	......	......	......	......	......
Cow Run	......	......	185	12	......	312	......	......	......	......	......	......	......
Craddock	......	......	......	......	990	990	540	257	......	......	......	......	......
Cutright Run	......	......	440	......	......	440	......	......	......	......	......	......	......
Czar	......	......	......	......	445	445	......	......	......	......	......	......	......
Danville	......	......	415	......	......	415	......	......	......	......	......	......	......
Elk City	......	......	334	......	......	334	......	......	......	......	......	......	......
Evergreen	......	......	185	186	......	371	......	......	......	......	......	......	......
Findley	......	......	......	175	280	455	......	......	......	......	......	......	......
Fink Run	......	100	150	......	......	250	......	......	......	......	......	......	......
Flora	......	......	568	213	......	781	......	......	......	......	......	......	......
French Creek	......	......	88	172	......	260	......	......	......	......	......	......	......
Frenchton	......	......	336	241	625	1202	429	111	310	850	420	......	42
Gage	......	......	......	142	344	486	......	......	......	......	......	......	......
Gale	......	......	......	......	280	280	......	......	......	......	......	......	......
Groundhog Hollow	......	375	175	......	......	550	......	......	......	......	......	......	......
Hall	......	......	125	185	......	310	......	......	......	......	......	......	......
Harding	......	......	......	110	116	226	......	......	......	......	......	......	......
Hartridge	......	......	......	......	643	643	42	......	......	42	......	......	......
Helvetia	......	......	......	......	535	535	......	......	......	......	......	......	......
Hemlock	......	......	......	......	400	400	......	......	......	......	......	......	......
Hinkle	......	......	(?)	(?)	......	365	......	......	......	......	......	......	......
Holly Grove	......	......	202	204	84	490	......	......	......	......	......	......	......

Table Showing Thickness in Feet of Stratified Rocks in Barbour, Upshur, and Western Randolph Counties (Continued).

Place Measured.	Pennsylvanian.						Mississippian.				Devonian.		
	Dunkard.	Monongahela.	Conemaugh.	Allegheny.	Pottsville.	Total.	Mauch Chunk.	Greenbrier Limestone.	Pocono Sandstones.	Total.	Catskill.	Chemung.	Total.
Honey Camp	.....	.....	90	210	480	780	.....	.....	.....	.....	.....	.....	.....
Imperial	.....	.....	.....	216	138	354	.....	.....	.....	.....	.....	.....	.....
Junior	.....	.....	(?)	(?)	.....	370	.....	.....	.....	.....	.....	.....	.....
Kedron	.....	.....	.....	65	185	250	.....	.....	.....	.....	.....	.....	.....
Lantz	.....	.....	.....	115	295	410	.....	.....	.....	.....	.....	.....	.....
Laurel	.....	.....	.....	48	181	229	.....	.....	.....	.....	.....	.....	.....
Laurel Branch of Middle Fork	.....	.....	.....	.....	818	818	107	.....	.....	107	.....	.....	.....
Laurel Ridge	.....	.....	.....	.....	505	505	35	.....	.....	35	.....	.....	.....
Leiter	.....	.....	.....	160	115	275	.....	.....	.....	.....	.....	.....	.....
Lick Run of Middle Fork	.....	.....	.....	.....	705	705	.....	.....	.....	.....	.....	.....	.....
Lost Run of Middle Fork	.....	.....	.....	.....	795	795	25	.....	.....	25	.....	.....	.....
Meadowville	.....	.....	583	196	.....	779	.....	.....	.....	.....	.....	.....	.....
Moatsville	.....	.....	290	200	140	630	.....	.....	.....	.....	.....	.....	.....
Nestorville	.....	.....	405	256	10	671	.....	.....	.....	.....	.....	.....	.....
Newlon	.....	.....	.....	.....	1053	1053	335	35	260	630	351	.....	351
O'Brien	.....	.....	45	252	293	590	.....	.....	.....	.....	.....	.....	.....
Overfield	.....	90	(?)	(?)	345	1300	285	90	428	803	436	2381	2817
Overhill	.....	.....	10	295	85	390	.....	.....	.....	.....	.....	.....	.....
Palace Valley	.....	.....	.....	.....	642	642	163	.....	.....	163	.....	.....	.....
Pecks Run	.....	365	70	.....	.....	435	.....	.....	.....	.....	.....	.....	.....
Peeltree	.....	330	150	.....	.....	480	.....	.....	.....	.....	.....	.....	.....
Pepper	.....	150	255	.....	.....	405	.....	.....	.....	.....	.....	.....	.....
Philippi	.....	.....	218	149	502	869	295	92	299	686	550	1378	1928
Pigtail Run	(?)	(?)	145	.....	.....	565	.....	.....	.....	.....	.....	.....	.....

Place Measured.	~~Mississippian.~~ [illegible]						~~Pennsylvanian.~~ [illegible]				Devonian.			
	Dunkard.	Monongahela.	Conemaugh.	Allegheny.	Pottsville.	Total.	Mauch Chunk.	Greenbrier Limestone.	Pocono Sandstones.	Total.	Catskill.	Chemung.	Total.	Total Section.
Pumpkintown	......	......	......	75	342	417	......	......	......	......	......	......	......	417
Queen	......	......	......	72	384	456	......	......	......	......	......	......	......	456
Reger	......	......	98	142	......	240	......	......	......	......	......	......	......	240
Right Branch of Gnatty Creek	......	280	105	......	......	385	......	......	......	......	......	......	......	385
Roaring Creek Junction	......	......	......	87	613	700	......	......	......	......	......	......	......	700
Ruraldale	......	325	220	......	......	545	......	......	......	......	......	......	......	545
Sago	......	......	66	195	817	1078	298	92	320	710	515	......	515	2303
Samp	......	......	......	......	800	800	630	60	......	690	......	......	......	1490
Sand Run	......	......	......	177	......	177	......	......	......	......	......	......	......	177
Silica	......	......	......	......	580	580	......	......	......	......	......	......	......	580
Skidmore	......	......	......	20	165	370	......	......	......	......	......	......	......	370
Stewart Run (Northern Branch)	30	405	75	......	......	510	......	......	......	......	......	......	......	510
Stewart Run (Southern Branch)	......	330	30	......	......	360	......	......	......	......	......	......	......	360
Stillman	......	......	115	215	60	390	......	......	......	......	......	......	......	390
Stockerts	......	......	......	55	573	628	650	282	178	......	......	......	......	1738
Stonecoal Run	......	190	110	......	......	300	......	......	......	......	......	......	......	300
Sunny Point	......	......	......	20	842	862	445	93	262	800	665	1057	1722	3384
Swamp Run	......	......	......	195	30	225	......	......	......	......	......	......	......	225
Tenmile	......	......	28	225	84	337	......	......	......	......	......	......	......	337
Trout Run	......	......	......	......	550	550	......	......	......	......	......	......	......	550
Turkey Run	......	50	631	265	584	1530	225	140	285	650	557	......	557	2737
Tygart Junction	......	......	205	228	52	485	......	......	......	......	......	......	......	485
Waneta	......	......	......	......	725	725	......	......	......	......	......	......	......	725
Wilmoth Ford	......	......	102	......	......	388	......	......	......	......	......	......	......	388
Yokum	......	......	......	110	260	370	......	......	......	......	......	......	......	370

CHAPTER V.

STRATIGRAPHY—THE MONONGAHELA SERIES.

GENERAL DESCRIPTION AND SECTION.

The Monongahela Series of the Pennsylvanian Rocks, first named and described by H. D. Rogers from its abundant outcrop along the Monongahela River in the State of Pennsylvania, and later described in more detail by John J. Stevenson, I. C. White, and others, covers only a small portion of Barbour and Upshur and is not represented at all in Randolph. As shown by Maps II and IV its principal area is in the Districts of Pleasant, Elk, and Union in western Barbour, and in Warren and Buckhannon in northern Upshur. Besides this belt where its outcrop is general, a few small areas, comprising a few acres each, are found in Cove and Barker Districts, Barbour, along the axis of the Belington Syncline.

As mentioned in the Introduction to Chapter IV, the Monongahela Series in western Barbour and northern Upshur is sometimes overlain with thin deposits of the Dunkard Series. The maximum thickness found for these rocks was 196 feet, as exhibited in the Bear Knob Section on page 117. This knob is situated near the axis of the Grassland Syncline where the rocks dip to a low level affording the best opportunity for studying them. In most of the ridges along the border of the two counties, they are seldom more than 50 to 100 feet thick. These rocks are entirely without economic importance, having no coals or limestones in either county, and as they have been described at much length in many previous reports of the Survey in counties where the maximum development is found, no detailed account of them is needed in this volume, but their outcrop wherever found has been placed on Maps II and IV, which show the Geologic Outcrops.

In Barbour and Upshur, the Monongahela Series consists mainly of sandstone beds, greenish or gray in color and often fine-grained, alternating with red or sandy shales, and a few thin limestones, and it contains two important coal seams of commercial thickness and purity, as well as two or three others that are not persistent or valuable. The abundant limestones that occur in the northwestern counties of the State and in western Pennsylvania are but poorly represented, only one of these, the Redstone, being of possible use for agricultural or road purposes. Three important coal beds, the Waynesburg. Sewickley, and Uniontown, that in some other counties are persistent and minable seams, have almost entirely disappeared in these counties. Taken as a whole, the series lacks many of its economic features, as found in the northwestern counties, but its thickness remains much the same, the percentage of sandstones and red beds being much greater. No marine fossils are known to occur and the fresh-water forms are scanty and microscopic.

The following general section, compiled from the detailed sections in Chapter IV as well as from many special observations, represents the maximum number and thickness of the Monongahela members noted in Barbour and Upshur. The series as observed varies from 350 to 410 feet in thickness, being usually about 400:

General Section of the Monongahela Series for Barbour and Upshur.

	Thickness. Feet.	Total. Feet.	
Waynesburg Coal (none found)	...	....	
Shale	20	20	
Sandstone, greenish-brown, Gilboy	25	45	
Shale	15	60	
Sandstone, greenish-gray, micaceous, often flaggy, Uniontown	30	90	
Shale, greenish-brown or red, Annabelle	9	99	
Coal, Uniontown, 0′ 0″ to	1	100	100′
Shale, gray	3	103	
Limestone, gray, Uniontown	2	105	
Shale, red and sandy	44	149	

	Thickness. Feet.	Total. Feet.	
Sandstone, greenish-gray, flaggy or massive, **Arnoldsburg**	30	179	
Coal, Lower Uniontown, 0′ 0″ to	1	180	80′
Shale, red and sandy	33	213	
Shale, green, **Fulton**	5	218	
Limestone, lenticular and shaly, **Benwood**	1	219	
Sandstone, massive, and gray, or shaly, **Upper Sewickley**	40	259	
Coal, Sewickley, 0′ 0″ to	1	260	80′
Shale, gray	15	275	
Sandstone, gray, **Lower Sewickley**	25	300	
Limestone, yellow and hard, lenticular, **Sewickley**	2	302	
Shale, red or sandy	22	324	
Sandstone, usually shaly, **Cedarville**	25	349	
Shale	5	354	
Coal, Redstone, 4′ 0″ to	6	360	100′
Shale	5	365	
Sandstone, shaly, **Weston**	20	385	
Limestone, gray, hard, **Redstone**	5	390	
Coal, Pittsburgh, 2′ 0″ to	10	400	40′

DESCRIPTION OF MEMBERS.

WAYNESBURG COAL.

The Waynesburg Coal, first named and described by H. D. Rogers from its outcrop at Waynesburg, Pennsylvania, and being the highest member of the Monongahela Series, was not observed at all in Barbour or Upshur, having evidently disappeared from the measures, its horizon being occupied by sandy shale or sandstone.

GILBOY SANDSTONE.

The Gilboy Sandstone of White[1], usually appearing 5 to 10 feet below the Waynesburg Coal horizon and 15 to 20 feet below the Waynesburg Sandstone at the base of the Dunkard, was observed frequently in western Barbour and northern Upshur although it is not a conspicuous ledge. It varies in thickness from 10 to 25 feet, and is usually brown in color, being sometimes flaggy but often massive or shaly. In Chapter IV, it is noted in the section for Stonecoal Run where it is 25 feet thick and flaggy, also in that for Bear Knob where it is green and flaggy and in that for Big Run where it is 10 feet thick. As an economic horizon it has little value, being usually too soft for building or road material. So far as known it has not been quarried in either county.

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[1] I. C. White, Vol. II, W. Va. Geol. Survey, p. 150; 1903.

UNIONTOWN SANDSTONE.

The Uniontown Sandstone of White[2], having its base about 100 feet below the top of the Monongahela Series, and about 300 feet above the Pittsburgh Coal, is found frequently in both Barbour and Upshur, but lacks the conspicuous cliff-forming qualities that it has in some of the counties along the Little Kanawha River farther west. In this territory it is usually greenish-gray and flaggy with numerous particles of mica. In Chapter IV, it is noted in the sections for both the North and South Branch of Stonecoal Run, Beechlick, and Peeltree in Barbour, while in Upshur it is recorded in those for Bear Knob, Big Run, and Groundhog Hollow, its thickness varying from 20 to 35 feet. So far as known, it has not been quarried in either county, and owing to its flaggy nature, it would be of doubtful value as a building material, although the flagstones split from it have been frequently used locally for building cellars and walks.

ANNABELLE SHALE.

The Annabelle Shale of the writer[3], named for its occurrence at Annabelle, Marion County, where it lies between the Uniontown Sandstone and Uniontown Coal and is used for brick making, usually loses its identity in Barbour and Upshur where it merges into the broad band of red shales that comes below the Uniontown Coal, the latter horizon being not often present to separate the two. In the section for Big Run, Upshur, Teets records 55 feet of red and sandy shales just below the Uniontown Sandstone, the upper portion of which would represent the Annabelle horizon.

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[2] I. C. White, Bull. 65, U. S. G. Survey, p. 58; 1891.

[3] Monongalia-Marion-Taylor Report, W. Va. Geol. Survey, p. 250; 1910.

UNIONTOWN COAL.

The Uniontown Coal, originally named and described by the First Geological Survey of Pennsylvania from the city of that name, has almost entirely disappeared in Barbour and Upshur. The only place where it was noted in either county was at **Exposure No. 1 on Map IV**, in Warren District, Upshur, 1.3 miles east of Bear Knob, where the writer observed the coal at the summit of the hill road. Here it was about 1 foot thick, at an elevation of 1610′ B., being 350 feet above the blossom of the Pittsburgh Coal, the interval from the latter horizon being excessive, owing to the westward dip toward the Grassland Syncline. The horizon of this coal was usually occupied by red and sandy shales proving that as an economic factor in the two counties it may be disregarded.

UNIONTOWN LIMESTONE.

The Uniontown Limestone, a subdivision made by J. J. Stevenson from the Great Limestone of the First Geological Survey of Pennsylvania, and belonging just below the Uniontown Coal, or about 15 feet below the Uniontown Sandstone, is present in the measures at a few localities in the two counties although it is too thin to be of economic importance other than as a soil-maker. In the sections for Arnold Run and Century, Barbour County, it was noted as being 1 foot thick, hard and gray, in both instances, while in that for Groundhog Hollow, in Upshur, it was only a mass of nodular concretions bedded in shale.

ARNOLDSBURG SANDSTONE.

The Arnoldsburg Sandstone of Hennen[4], located about 220 feet above the Pittsburgh Coal, is present in the measures throughout western Barbour and northern Upshur but lacks the massive cliff-forming character of its type locality. It is usually greenish-gray in color, flaggy and micaceous, though sometimes massive, varying in thickness from 10 to 35 feet.

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[4] Ray V. Hennen, Wirt-Roane-Calhoun Rept., W. Va. Geol Survey, p. 202; 1911.

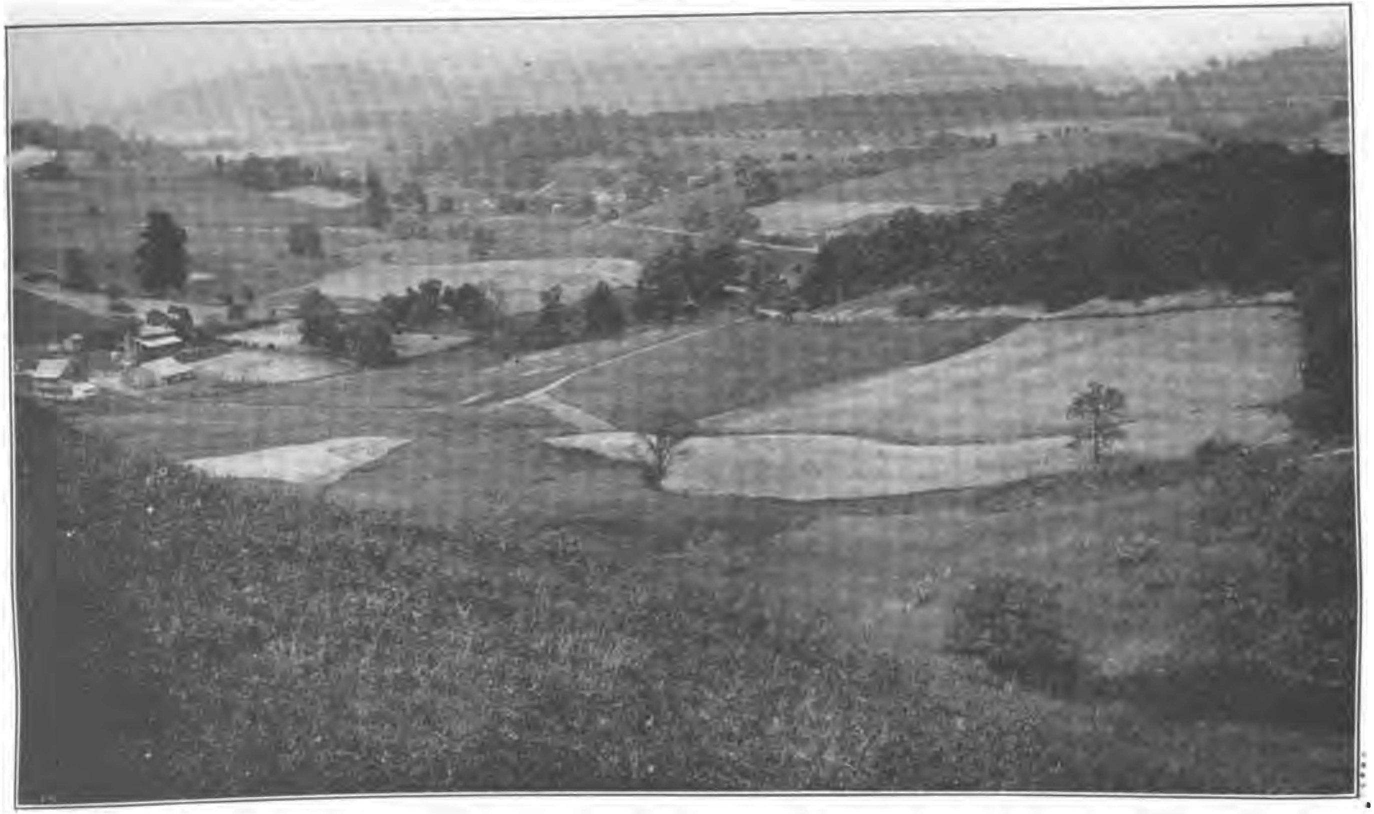

PLATE XII.—View looking north from hill 0.9 mile south of Meadowville, Barbour County, showing low rounded hills made by soft Conemaugh shales; village of Meadowville occupies central background.

In Chapter IV it is noted in the sections for Astor, Berryburg, Stonecoal Run, both branches of Stewart Run, and Beechlick in Barbour, and in those for Bear Knob, Right Branch of Gnatty Creek, and Charity Fork in Upshur. So far as known it has not been quarried in either county, being usually too soft for durable building material.

LOWER UNIONTOWN COAL.

The Lower Uniontown Coal of Haas[5], occurring just below the Arnoldsburg Sandstone, was seldom noted in either county. In the section for the northern branch of Stewart Run, published in Chapter IV, it is noted as being 0′ 7″ thick, 29 feet below the Arnoldsburg Sandstone and 175 feet above the Pittsburgh Coal. It was not observed elsewhere and may be disregarded as an economic horizon.

FULTON GREEN SHALE.

The Fulton Green Shale of Grimsley[6], occurring just over the Benwood Limestone, is not conspicuous as a stratigraphic horizon, though its presence is noted in Barbour in the section for Astor where it is 5 feet thick and sandy and in that for Stonecoal Run where it is 19 feet and sandy, as published in Chapter IV.

BENWOOD LIMESTONE.

The Benwood Limestone, first named by I. C. White as a subdivision of the Great Limestone of the First Geological Survey of Pennsylvania, from its occurrence at Benwood, Marshall County, West Virginia, and belonging above or sometimes replacing the Upper Sewickley Sandstone, is not prominent in Barbour and Upshur, although it is sometimes found. In Barbour it is noted in the section for Astor, 5 feet thick, gray and hard; in that for Pigtail Run, 2 feet thick; and in that for Stonecoal Run, 1 foot thick, all of which were published in Chapter IV. In Upshur it was noted by the writer on Hackers Creek along the hill road 1.1 miles east of Bear Knob, at an elevation of 1465′ B., and being shaly and nodular. As an economic horizon it is of value principally as a soil-former, although in a few places enough of it might be found to burn into quicklime or for use as road macadam. It should belong, as a rule, about 180 feet above the Pittsburgh Coal.

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[5] Frank Haas, Vol. II(A), W. Va. Geol. Survey, p. 680; 1908.

[6] G. P. Grimsley, Ohio-Brooke-Hancock Report, W. Va. Geol. Survey, p. 92; 1906.

UPPER SEWICKLEY SANDSTONE.

The Sewickley Sandstone of White[7], later termed the **Upper Sewickley** by Hennen[8], is of frequent occurrence all over the two counties where the Monongahela Series is found. In Barbour it is noted in the sections for Arnold Run and Century, and in Upshur it appears in those for Bear Knob, Groundhog Hollow, Right Branch of Gnatty Creek, and Charity Fork, all of which are published in Chapter IV. It varies in thickness from 15 to 45 feet, and as a rule is massive and gray, although it is sometimes flaggy or shaly. It is one of the most persistent and easily recognized sandstone members of the Monongahela Series, sometimes forming a cliff although more often it usually makes only a steep bluff in the topography above which the soft shales slope gently away toward the next sandstone above it, and below which the steep bluff is practically continuous for about 140 feet down to the Pittsburgh Coal. So far as known the Upper Sewickley has not been quarried but it could be used for rough masonry and concrete aggregate. It belongs about 140 feet above the Pittsburgh Coal, and can readily be found from the outcrop of the latter horizon which is shown on Maps II and IV.

SEWICKLEY COAL.

The Sewickley Coal, first named and described by H. D. Rogers from Sewickley Creek, Pennsylvania, and belonging just below the Upper Sewickley Sandstone, and about 140 feet

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[7] I. C. White, Bull, 65, U. S. Geol. Survey, p. 60; 1891.

[8] Ray V. Hennen, Doddridge-Harrison Rept., W. Va. Geol. Survey p. 199; 1912.

	Thickness. Feet.	Total. Feet.
Sandstone, shaly, Lower Sewickley	22	22
Slate, black, 1"	...	22
Shale, yellow	1	23
Limestone, yellow, good, Sewickley	1	24
Limestone, yellow and brecciated	12	36
Sandstone, shaly, Cedarville	24	60
Shale, sandy	6	66
Concealed	25	91
Sandstone, shaly	2	93
Shale, dark	8	101
Slate, black	3	104
Coal, Pittsburgh (1255' B.)	7	111

A sample of the limestone was collected here, the analysis of which is reported as follows by Messrs. Hite and Krak:

	Per cent.
Silica (SiO_2)	21.35
Ferric Iron (Fe_2O_3)	3.69
Alumina (Al_2O_3)	4.75
Calcium Carbonate ($CaCO_3$)	65.65
Magnesium Carbonate ($MgCO_3$)	2.27
Phosphoric Acid (P_2O_5)	0.20
Loss on ignition	1.27
Total	99.18

This analysis indicates a limestone suitable for road material or agricultural purposes.

Taken as a whole, the Sewickley Limestone in the two counties will be found chiefly valuable as a soil-maker, as its thin and lentil character prevent it from being quarried on a commercial scale.

CEDARVILLE SANDSTONE.

The Cedarville Sandstone of the writer[10], named from its occurrence at the town of that name in Gilmer County, and coming between the Sewickley Limestone and the Redstone Coal, is of frequent occurrence in Barbour and Upshur, but is usually flaggy or shaly, often being represented by sandy shale, the typical color of the ledge, when present, being greenish-gray. In Chapter IV it is noted in the Barbour County Sections for Stonecoal Run, Stewart Run (North

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[10] Lewis and Gilmer Report, W. Va. Geol. Survey, p. 124; 1916.

Branch), Arnold Run, and Century; and in the Upshur County Sections for Ruraldale, Pecks Run, and Charity Fork. In these sections the thickness varies from 10 to 40 feet. So far as observed this sandstone has not been quarried, and as a rule, its shaly character would prohibit its use for economic purposes.

REDSTONE COAL.

The Redstone Coal of H. D. Rogers, named from its outcrop along Redstone Creek in Fayette County, Pennsylvania, occurs generally throughout western Barbour and northern Upshur where the Monongahela Series crops, being usually free from slate or shale partings and varying in thickness from 4 to 6 feet, and coming about 40 feet above the Pittsburgh Coal. Its outcrop is shown on Maps II and IV and in Chapter XI a detailed account with mine sections and chemical analyses will be given.

WESTON SANDSTONE.

The Weston Sandstone of the writer[11], named from its occurrence at Weston, Lewis County, and coming between the Redstone Coal and Redstone Limestone, was seldom noted in Barbour and Upshur, its horizon being usually occupied by sandy shale. In the sections for Upshur County, published in Chapter IV, its presence was recorded in those for Groundhog Hollow, Pecks Run, and Charity Fork, where its thickness varies from 20 to 50 feet, and its character is shaly. So far as observed, it has not been quarried in either county, and, owing to its poor development, its use for building material would not be advisable.

REDSTONE LIMESTONE.

The Redstone Limestone of J. J. Stevenson, named from its relationship to the Redstone Coal, and, belonging between the Weston Sandstone and Pittsburgh Coal, was frequently noted in both Barbour and Upshur. It is usually hard and firm, gray on fresh fracture, but weathering to a characteristic yellow color, and varies in thickness from 2 to 6 feet, the average being about 4 feet. Like other limestones of the Monongahela Series, it contains fresh-water fossils of microscopic size. Because of its position about midway between the Redstone and Pittsburgh Coals, it is a most important stratigraphic horizon, as it often serves to identify one of these beds at points where one or the other is concealed by soil or debris, there being no other limestone of similar character in the immediate interval above or below it.

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[11] Lewis and Gilmer Report, W. Va. Geol. Survey, pp. 124-126; 1916.

In the sections for Barbour, published in Chapter IV, the limestone is noted in that for Pigtail Run, 4 feet thick; Berryburg, 2 feet thick; Stewart Run (North Branch), 38 feet thick; and in Upshur, it is recorded in that for Bear Knob, 2 feet thick; Ruraldale, 2 feet; and Pecks Run, 4 feet thick. The following exposure was noted by Teets in Union District, Barbour, on the north side of Gnatty Creek, 1.3 miles southeast of Peeltree, on the land of Frank Maxwell:

	Feet.
Coal, Redstone	5
Shale and slate	15
Limestone, Redstone (1225′ B.)	7
Concealed	12
Coal, Pittsburgh	6

A sample of this limestone was collected, the analysis of which is reported by Krak as follows:

	Per cent.
Silica (SiO_2)	4.83
Ferric Iron (Fe_2O_3) and Alumina (Al_2O_3)	3.23
Calcium Carbonate ($CaCO_3$)	85.93
Magnesium Carbonate ($MgCO_3$)	5.08
Phosphoric Acid (P_2O_5)	0.21
Loss on ignition	0.23
Total	99.51

Two other exposures of the limestone were noted by Teets in the same locality, one of them being 2.3 miles east of Peeltree, near the forks of the Gnatty Creek road, where it was 5 feet thick, at an elevation of 1292′ B., and the other being on the Lee Morrison property at the head of Cranes Fork, 1.5 miles northwest of Simons, where it had formerly been burnt for agricultural purposes and was reported 5 to 6 feet thick, at an elevation of about 1315′ B.

In Upshur County, the Redstone Limestone was observed by Teets on the **Lloyd Teter farm**, just east of Pecks Run village, where it was 4 feet thick and had an elevation of 1440′ B. A sample collected at this point showed the following analysis, according to Krak:

	Per cent
Silica (SiO_2)	9.06
Ferric Iron (Fe_2O_3) and Alumina (Al_2O_3)	4.02
Calcium Carbonate ($CaCO_3$)	81.70
Magnesium Carbonate ($MgCO_3$)	3.56
Phosphoric Acid (P_2O_5)	0.08
Loss on ignition	1.40
Total	99.82

According to Teets, also, the limestone was formerly burned for agricultural purposes by Anthony and Bird Casto on the **A. Karickhoff farm**, the quarry being located 0.3 mile south of Pecks Run, at an elevation of 1440′ B., and 17 feet below the Redstone Coal.

Another exposure was noted by Teets along the same branch of Pecks Run, in the public road, 0.7 mile south of the village, where he secured the following section:

	Feet.
Shale, sandy	
Limestone, bluish-gray, massive, Redstone (1470′ B.)	3
Coal, Pittsburgh	5

In the public road at the head of Mudlick Run, 3 miles northwest of Buckhannon, the writer noted the limestone 2 feet thick, at an elevation of 1485′ B., being 25 feet below the blossom of the Redstone Coal. Another exposure noted by the writer was on the **Isaac S. Reger farm** on Hackers Creek, 2.3 miles west of Ruraldale, where the limestone was 3 feet thick, gray on fresh fracture, but weathering yellow, and containing microscopic **Spirorbis** fossils, and being at an elevation of 1225′ B., 15 feet, by hand-level, above the blossom of the Pittsburgh Coal.

PITTSBURGH COAL.

The Pittsburgh Coal, first named and described by J. P. Lesley in 1856 at the city of Pittsburgh, Pennsylvania, and belonging at the base of the Monongahela Series, occurs generally in western Barbour and northeastern Upshur, varying from 5 to 9 feet in thickness. A few small deposits of a few acres each are also found in eastern Barbour along the axis of the Belington Syncline, where it reaches a thickness of 10 feet or more. In Upshur the coal thins rapidly westward until it is not of minable thickness along the Lewis County Line. In western Barbour, where the coal has its best development in the territory of this Report, the following type section is found:

			Ft.	In.
Draw slate				
Coal, good	4'	6"		
Coal, hard, bony, 0' 4" to	0	6		
Coal, good, to pavement	4	0	9	0

The bony coal, coming at the middle of the seam, represents the three streaks of bone usually found along the Monongahela River, only two being found in the same coal in southern Taylor next to Barbour. The slaty and sulphurous roof coal of the Monongahela Valley has almost entirely disappeared in Barbour, making the coal of minable purity clear to the draw slate, but the upper foot of the coal is often left in place to prevent the disintegration of the soft roof shales.

The outcrop of the coal, in those regions where it is of minable thickness, is shown on Maps II and IV. In western Upshur where it has little or no thickness, it is not shown as a coal outcrop, but its position may be readily found on the maps by the base of the Monongahela Series, with which it coincides. This coal has also been used as the basis of the **green structure contours** shown on Maps II and IV, and from these its approximate elevation at any point is available.

In Chapter XI, the thickness, chemical quality, and distribution, together with numerous detailed sections of mines examined, and an estimate of tonnage, will be given under the subject of "Coal."

CHAPTER VI.

STRATIGRAPHY—THE CONEMAUGH SERIES.

GENERAL DESCRIPTION AND SECTION.

The Conemaugh Series of the Pennsylvanian Rocks, first named by Franklin Platt, in 1878, from its outcrop along the Conemaugh River in Pennsylvania, includes a large portion of the surface rocks of both Barbour and Upshur, as its areal limits on Maps II and IV will show. The series has been described thoroughly by White in a former volume of the Survey[1] and in Barbour and Upshur differs but little from that description in its general features. It consists of numerous gray or brown sandstone beds, varying from 10 to 50 feet in thickness, usually separated by red or sandy shales and a few impure fire clays, and has several coal seams, of which two have minable thickness in some localities. An interesting feature of the series is the presence of three fossiliferous marine limestone horizons, one of which, the Ames, is the most recent in the State that is known to contain them. Its limestones are not important commercially, all of them being thin and most of them impure, only a few of them being of possible local use for concrete or agricultural purposes. The thickness of the Conemaugh varies from 550 to 650 feet. The following general section, compiled from numerous detailed sections in Chapter IV, as well as from many local observations, shows the characteristic features of the series in Barbour and Upshur:

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[1] I. C. White, Vol. II, W. Va. Geol. Survey, pp. 225-230; 1903.

General Section of the Conemaugh Series of Barbour and Upshur.

	Thickness. Feet.	Total. Feet.	
Fire clay and shale	5	5	
Sandstone, massive, **Lower Pittsburgh**	35	40	
Shale, gray	4	44	
Coal, Little Pittsburgh	1	45	45'
Shale, variegated and sandy	28	73	
Sandstone, massive, gray or brown, **Connellsville**	50	123	
Coal, Little Clarksburg	2	125	80
Fire clay shale, **Clarksburg**	5	130	
Limestone, gray, lenticular, **Clarksburg**	2	132	
Shale, red, **Clarksburg**, upper portion	27	159	
Sandstone, massive, gray or brown, often pebbly, **Lower Connellsville**	40	199	
Coal, Normantown	1	200	75'
Shale, red, **Clarksburg**, lower portion	23	223	
Sandstone, massive or flaggy, gray or brown, **Morgantown**	30	253	
Shale, sandy	5	258	
Limestone, shaly, lenticular, with fresh-water fossils, **Orlando**	2	260	
Coal, Elk Lick, 2' 0" to	5	265	65'
Fire clay and shale	3	268	
Limestone, gray, lenticular, **Elk Lick**	2	270	
Coal, lenticular, West Milford, 0" to	1	271	8'
Shale, sandy and red, **Birmingham**	10	281	
Sandstone, brown, massive, often pebbly, **Grafton**	30	311	
Limestone, dark, shaly, lenticular, with marine fossils, Upper Ames	1	312	
Shale, dark-green, with marine fossils, Ames	10	322	
Limestone, dark, shaly, lenticular, with marine fossils, Lower Ames	1	323	
Coal, Harlem	2	325	54'
Shale, yellow	10	335	
Shale, red, **Pittsburgh Reds**, upper portion	10	345	
Sandstone, shaly, lenticular, **Jane Lew**	15	360	
Shale, red and variegated, **Pittsburgh Reds**	32	392	
Sandstone, massive, brown, often pebbly, **Saltsburg**	30	422	
Coal, Bakerstown	3	425	100'
Shale, gray and variegated	34	459	
Limestone, lenticular, sometimes containing marine fossils, Pine Creek	1	460	
Shale, sandy	5	465	
Sandstone, massive, gray, often pebbly, **Buffalo**	50	515	
Limestone, dark, with marine fossils, Brush Creek	1	516	
Shale, dark, with marine fossils, Brush Creek	8	524	
Coal, Brush Creek	1	525	100
Shale, gray	9	534	

	Thickness. Feet.	Total. Feet.	
Sandstone, massive, gray, often pebbly, Upper Mahoning	30	564	
Coal, not persistent, Mahoning, 0″ to	1	565	
Fire clay, lenticular, Thornton, 0″ to	5	570	
Sandstone, massive, gray, often pebbly, Lower Mahoning	45	615	
Shale, dark, sandy, with plant fossils, Uffington	5	620	
Coal, Upper Freeport (Top of Allegheny Series	...	...	95′

The section, as given above, shows a total thickness slightly less than the maximum, but somewhat greater than the average for the two counties, since many of the members are lenticular, being absent in some localities. Numerous measured sections, giving detailed exposures in different places, are published in Chapter IV.

DESCRIPTION OF MEMBERS.

LOWER PITTSBURGH SANDSTONE.

The Lower Pittsburgh Sandstone of White[2], usually separated by a thin bed of shale from the overlying Pittsburgh Coal, is often present in the measures but lacks the conspicuous cliff-forming character that it often has in some of the neighboring counties, being frequently shaly or represented by sandy shale. At its best development in the two counties, it is usually massive, gray, medium-grained, and only medium-hard, varying in thickness from 15 to 50 feet. It was noted by Teets in the railroad cut at Berryburg, Barbour, where it was 20 feet thick, and massive, at an elevation of 1380′ B. In the sections for Barbour, published in Chapter IV, it is coarse, gray, and 45 feet thick at Colebank; 22 feet thick at Danville; 35 feet at Flora; and in Upshur, it is 15 feet at Big Run; 20 feet at Groundhog Hollow; 20 feet at Right Branch of Gnatty Creek; and 47 feet thick and shaly at Buckhannon. No quarries were observed on this ledge in either county and its use for building purposes would not be advisable except possibly for bridge abutments, cellars, or other rough masonry at points where more durable stone could not readily be secured.

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[2] I. C. White, Vol. II, W. Va. Geol. Survey, p: 244; 1903.

LITTLE PITTSBURGH COAL.

The Little Pittsburgh Coal of White[3], belonging 40 to 50 feet below the Pittsburgh Coal, was noted at a few points in Barbour but not at all in Upshur. In the former county it is everywhere too thin for commercial mining and it has been disregarded entirely for local fuel because the Redstone and Pittsburgh both occur in the region where it is found.

At **Coal Exposure No. 180 on Map II,** located on West Branch of Simpson Creek, 1.8 miles south of Astor, Teets noted 1 foot of Little Pittsburgh Coal, as given in the section for Astor, page 81.

The following outcrop was observed by Teets in the same vicinity:

Coal Exposure—No. 181 on Map II.

On Simpson Creek, 1.6 miles southeast of Astor; **Little Pittsburgh Coal**; elevation, 1190′ B.

	Ft.	In.
Slate	1	0
Coal	1	6
Slate		

On Camp Run of Simpson Creek, 2 miles northwest of Berryburg, Teets noted 2 feet of Little Pittsburgh Coal, at **Exposure No. 182 on Map II,** coming at an elevation of 1210′ B., and 40 feet below an opening in the Pittsburgh Coal.

At **Exposure No. 183 on Map II,** along the hill road just south of Berryburg, Teets noted 1′ 1″ of slaty coal, at an elevation of 1420′ B.

A few outcrops of the Little Pittsburgh Coal were noted by Teets in Elk District. At **Exposure No. 184 on Map II,** on Stewart Run, 1.5 miles southwest of Berryburg, the coal was 1′ 11″ thick, at an elevation of 1325′ B., but was impure and slaty, as noted in the section for Stewart Run (Northern Branch), published on page 88.

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[3] I. C. White, Vol. II, W. Va. Geol. Survey, p. 245; 1903.

CONNELLSVILLE SANDSTONE.

The Connellsville Sandstone of J. J. Stevenson, named from its outcrop at Connellsville, Pennsylvania, is found generally throughout the region of Conemaugh outcrop in Barbour and Upshur, although it is not so well developed as in some other counties. It is usually gray or brown in color, massive and frequently conglomeratic, varying in thickness from 20 to 50 feet, and having its base 100 to 140 feet below the Pittsburgh Coal. As a quarry stone for general purposes it would probably prove more desirable than any of the sandstone horizons previously mentioned in the Monongahela or Conemaugh Series.

In the sections in Chapter IV., it is noted in Barbour at Pepper, 20 feet thick; at Peeltree, 20 feet thick and massive; at Colebank, 55 feet thick and pebbly; at Flora, 23 feet thick and brown in color; at Belington, 20 feet thick, brown and pebbly. In Upshur, it is noted at Bear Knob, 27 feet thick; at Big Run, 20 feet thick and massive; at Groundhog Hollow, 25 feet thick; at Buckhannon, 15 feet thick and massive; and at Cutright Run, 50 feet thick and shaly.

The **Thomas J. Farnsworth quarry,** located one-half mile west of Buckhannon and one-fourth mile north of Jawbone Run, shows the following structure, as observed by Teets and the writer:

	Feet.
Shale, brown, sandy	10
Sandstone, massive, brown, soft, Connellsville, visible	10
Concealed	

Here the stone is soft and friable, weathering badly on continued exposure. The quarry is 75 feet long and extends into the hill 15 feet. The stone was formerly used for general building purposes but the quarry has been abandoned.

LITTLE CLARKSBURG COAL.

The Little Clarksburg Coal of White[4], belonging just under the Connellsville Sandstone, and from 100 to 140 feet below the Pittsburgh Coal, was observed frequently in Barbour, and at a few points in Upshur but is not of commercial thickness and purity in either county. The following exposures noted by Teets will show its character in Barbour:

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[4] I. C. White, Bull. 65, U. S. Geol. Survey, p. 88; 1891.

At **Coal Exposure No. 185 on Map II,** on West Branch of Simpson Creek, 1.7 miles southward from Astor, it was 1 foot thick, at an elevation of 1140′ B.

At **Coal Exposure No. 186 on Map II,** on Simpson Creek, 1.8 miles southeast of Astor, it was 0′ 9″ thick, at an elevation of 1135′ B.

At **Coal Exposure No. 187 on Map II,** on Brushy Fork of Elk, 1.1 miles west of Pepper, as shown by the section for the latter place, published on page 87, the coal was 2 feet thick.

At **Coal Exposure No. 188 on Map II,** on Stewart Run, 1.5 miles due east of Pepper, the blossom of the coal was 2′ 6″ thick in the county road, its elevation being 1235′ B.

The following outcrop shows the relationship of the Little Clarksburg Coal with the two underlying members of the Series:

Coal Exposure—No. 189 on Map II.

On Stewart Run, 2.3 miles southeast of Pepper; **Little Clarksburg Coal**; elevation, 1210′ B.

	Ft.	In.
Shale		
Coal, **Little Clarksburg**	0	10
Fire clay, **Clarksburg**	2	0
Shale	1	2
Limestone, hard, gray, **Clarksburg**	1	6

Coal Exposure—No. 190 on Map II.

On a branch of Elk Creek, 1 mile northwest of Elk City; **Little Clarksburg Coal**; elevation, 1365′ B.

	Ft.	In.
Slate		
Coal, crop, **Little Clarksburg**	2	0
Shale, slaty, **Clarksburg**	2	0
Limestone, impure, **Clarksburg**	0	6

Coal Exposure—No. 197 on Map II.

On Left Fork of Gnatty Creek, 1.8 miles southeast of Peeltree; Little Clarksburg Coal; elevation, 1090' B.

	Ft.	In.
Sandstone, massive, Connellsville	15	0
Shale	7	0
Coal, Little Clarksburg	2	0
Limestone, Clarksburg	2	0

At **Coal Exposure No. 198 on Map II**, on Left Branch of Gnatty Creek, 2 miles northeast of Century, the Little Clarksburg Coal is 2 feet thick, as shown by the Century Section, on page 92.

Coal Exposure—No. 199 on Map II.

On Wash Run, 1.9 miles north of Volga; Little Clarksburg Coal; elevation, [illegible] B.

	Ft.	In.
Shale, full of plant fossils		
Coal	1	1
Shale		

Coal Exposure—No. 200 on Map II.

On Rock Run of Pecks Run, 1.2 miles west of Volga; Little Clarksburg Coal; elevation, [illegible] B.

			Ft.	In.
Shale, sandy			5	[illegible]
Shale, [illegible]			2	[illegible]
Coal	[illegible]	[illegible]		
Shale, slaty	[illegible]	[illegible]		
Coal	[illegible]	[illegible]	[illegible]	[illegible]
[illegible], Clarksburg			[illegible]	[illegible]

[illegible] **At Alfred Moore Opening, No. [illegible] on Map II**, [illegible] Belington [illegible] Belington Section [illegible]

[illegible]

Coal Exposure—No. 197 on Map II.

On Left Fork of Gnatty Creek, 1.8 miles southeast of Peeltree; Little Clarksburg Coal; elevation, 1090' B.

	Ft.	In.
Sandstone, massive, Connellsville	15	0
Shale	7	0
Coal, Little Clarksburg	2	0
Limestone, Clarksburg	2	0

At **Coal Exposure No. 198 on Map II,** on Left Branch of Gnatty Creek, 2 miles northeast of Century, the Little Clarksburg Coal is 2 feet thick, as shown by the Century Section, on page 92.

Coal Exposure—No. 199 on Map II.

On Wash Run, 1.9 miles north of Volga; Little Clarksburg Coal; elevation, 1515' B.

	Ft.	In.
Slate, full of plant fossils		
Coal	1	1
Slate		

Coal Exposure—No. 200 on Map II.

On Rock Run of Pecks Run, 1.2 miles west of Volga; Little Clarksburg Coal; elevation, 1470' B.

			Ft.	In.
Shale, sandy			5	0
Slate, gray			2	0
Coal	0'	5"		
Shale, slaty	4	0		
Coal	0	2	4	7
Fire clay, Clarksburg			3	0

In the Belington Syncline in eastern Barbour, very few exposures of the Little Clarksburg Coal were noted. In the Colebank Section, published on page 101, its presence is indicated by a blossom, and at the **Alfred Moore Opening, No. 201 on Map II,** located on the ridge 1.5 miles north of Belington, the coal has once been worked, as shown by the Belington Section on page 112, but the opening had fallen shut when visited by the writer and its thickness was not obtained.

In Upshur the Little Clarksburg Coal has almost entirely disappeared from the measures, only the following exposure being noted by Teets:

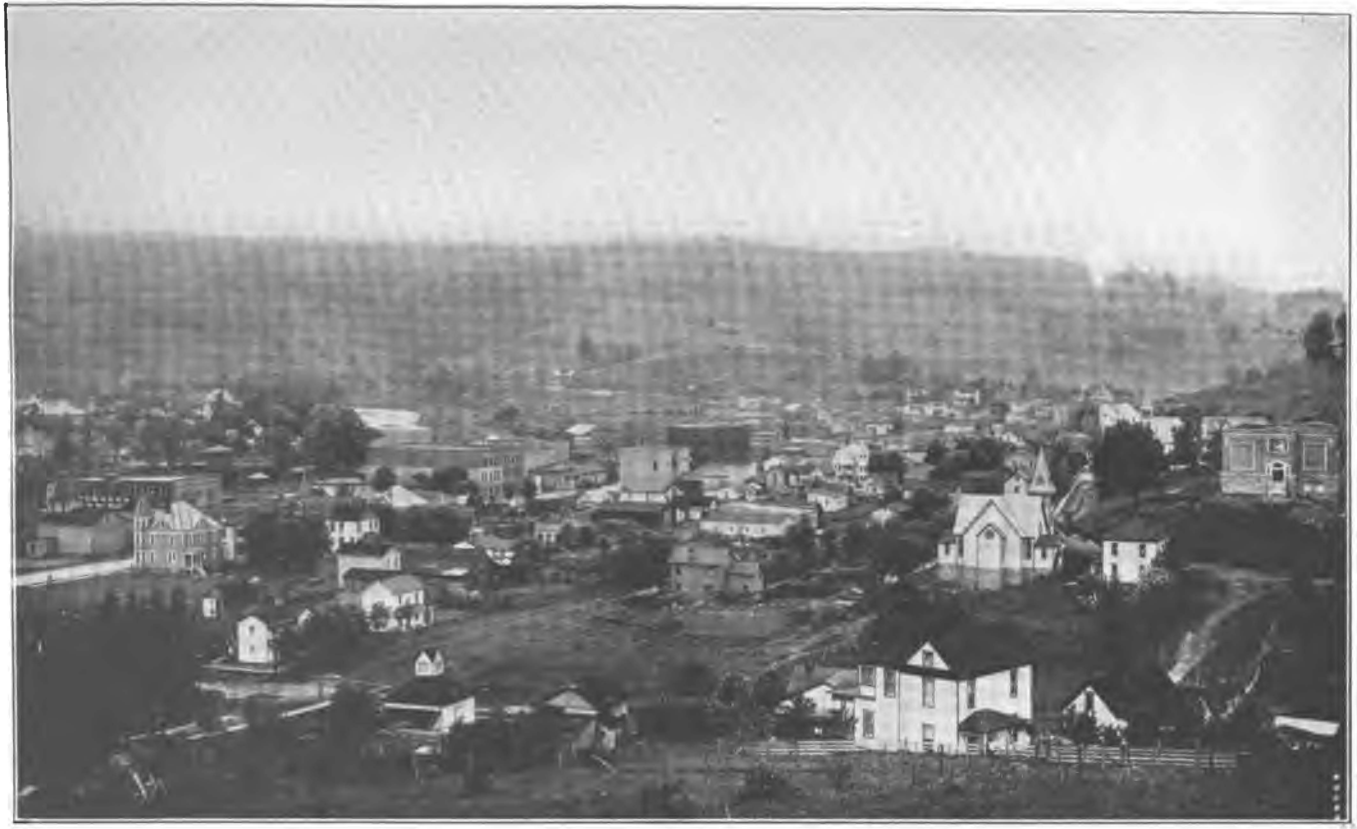

PLATE XIII.—View of Belington, Barbour County, looking north; Ridge in background is capped by the hard Connellsville Sandstone, making broad flat on top; Topography of the Conemaugh Series.

Coal Exposure—No. 202 on Map IV.

On Hackers Creek, 0.5 mile east of Ruraldale; **Little Clarksburg Coal**; elevation, 1180′ B.

			Ft.	In.
Fire clay shale, roof				
Coal	0′	1″		
Slate	0	2		
Coal	0	3		
Slate	0	2		
Coal	0	4	1	0
Slate, floor				

CLARKSBURG FIRE CLAY SHALE.

The Clarksburg Fire Clay Shale of Hennen[5], lying just under the Little Clarksburg Coal, is usually too thin for commercial exploitation. In the preceding discussion of the Little Clarksburg Coal, its presence is noted at Coal Exposures Nos. 189, 190, 195, and 200, varying in thickness from 2 to 3 feet and usually separating the coal from the Clarksburg Limestone. In the section for Belington, published on page 112, this fire clay is shown to be 6 feet thick and flinty, this latter condition being most unusual in the Conemaugh Series. A sample was collected here by the writer on the land of **Burton Rohrbaugh**, 1 mile northwest of Belington, the analysis of which is as follows, according to Messrs. Hite and Krak:

	Per cent.
Silica (SiO_2)	50.47
Ferric Iron (Fe_2O_3)	8.67
Alumina (Al_2O_3)	23.19
Lime (CaO)	0.75
Magnesia (MgO)	0.65
Potassium Oxide (K_2O)	0.43
Sodium Oxide (Na_2O)	0.46
Titanium Oxide (TiO_2)	1.03
Phosphoric Acid (P_2O_5)	0.23
Moisture	4.78
Loss on ignition	9.83
Total	100.49

Another exposure of this fire clay was noted by the writer on the land of **T. Benton Teter**, on the top of the ridge east of Wolf Run, and 1.9 miles northward from Belington, where it was 10 feet thick, and flinty, coming 110 feet, by aneroid, above an abandoned opening in the Elk Lick Coal. The flinty condition of the clay was not observed elsewhere outside of this immediate vicinity. The two exposures noted were in the same ridge but more than a mile apart, and it is possible that prospecting between these two points would develop a valuable brick horizon, as the clay could easily be mined and conducted by gravity down the hill to the railroad at Belington.

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[5] Ray V. Hennen, Doddridge-Harrison Rept., W. Va. Geol. Survey, p. 236; 1912.

CLARKSBURG LIMESTONE.

The Clarksburg Limestone of White[6], coming just under the Clarksburg Fire Clay Shale, and only a few feet below the Clarksburg Coal, is frequently found in Barbour and Upshur, but lacks much of its typical development as shown at Clarksburg. It is usually not more than two feet thick and is often shaly but sometimes gray and hard, being of better appearance in western Barbour than in any other locality of the two counties. In the sections of Chapter IV, its presence is noted at Overfield, 3 feet thick; at Pepper, 2 feet thick; at Century, 2 feet thick; at Colebank, 0′ 6″ thick and shaly; and at Buckhannon, 0′ 6″ thick. In the preceding discussion of the Little Clarksburg Coal, its thickness and character are shown at Coal Exposures Nos. 189, 190, 195, 196, and 197.

An exposure of this limestone was observed by Teets on Beechlick Run of Elk, 2.3 miles west of Elk City, where it formed a hard, blue, massive ledge, 4 feet thick, at an elevation of 1170′ B., being just under the Little Clarksburg Coal.

A sample of the Clarksburg Limestone was collected by Teets in the public road through the **Taylor Ward Farm** on Gnatty Creek, 1.2 miles southeast of Peeltree, Union District, where the section published for **Coal Exposure No. 195,** on page 207, shows the limestone to be 3 feet thick. Mr. Ward has crushed lime from this exposure for agricultural purposes. The analysis of the sample is as follows, according to Messrs. Hite and Krak:

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[6] I. C. White, Vol. II, W. Va. Geol. Survey, p. 249; 1903.

stone all occur in descending sequence. It seems clear, therefore, that the thin limestone found by Hennen in the vicinity of Morgantown, below the Lower Connellsville Sandstone, did not represent the true Clarksburg, but is still an unclassified horizon* and that the general section of the Conemaugh, published on page 202 of this Chapter, shows the true relationship of these members.

LOWER CONNELLSVILLE SANDSTONE.

The Lower Connellsville Sandstone of Hennen[8], belonging below the Clarksburg Limestone, and having its base about 200 feet below the Pittsburgh Coal, was observed frequently in both Barbour and Upshur, being usually greenish-gray or brown in color, nearly always massive and sometimes pebbly. In Chapter IV, it is noted in Barbour in the sections for Elk City, Colebank, and Meadowville, and in Upshur it appears in those for Bear Knob, Groundhog Hollow, Ruraldale, and Cutright Run, varying in thickness from 10 to 35 feet.

At the **Benjamin Bassell Heirs quarry,** located on the north side of Fink Run, 1.5 miles northwest of Buckhannon, and just northwest of the Upshur Fair Ground, the Lower Connellsville Sandstone was once quarried, but the place has been long since abandoned as sycamore trees of more than 1 foot diameter are growing in the old excavation. Here the stone is greenish-gray, medium-hard, fine-grained, micaceous, and massive, 10 feet of it being exposed, at an elevation of 1440′ B. The quarry is 75 feet long and extends 30 feet into the hill. It was understood that this stone was used for macadam on the Parkersburg and Staunton Turnpike, which was built more than sixty years ago, but this report was not verified.

At the **Academy Hill quarry,** located at the southwest edge of Buckhannon, the stone has been quarried for concrete

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*The limestone above referred to has since been renamed by Hennen the **Mona Limestone,** as given in pages 191-192 of the Braxton and Clay Detailed County Report issued October 1, 1917.—I. C. W.

[8] Ray V. Hennen, Monongalia-Marion-Taylor Report, W. Va. Geol. Survey, p. 277; 1913.

aggregate, a section made here showing the following as observed by Teets and the writer:

	Feet.
Soil from top of knob	5
Sandstone, brown, Lower Connellsville	15
Concealed	

Here the stone is hard and micaceous, with some shaly streaks and numerous joint- and bedding-planes, the quarry being 50 feet long and extending 60 feet into the hill.

NORMANTOWN COAL.

The Normantown Coal of the writer[9], occurring just under the Lower Connellsville Sandstone, was observed at a few points in both counties, but is not a persistent horizon in either county. In Barbour, it was noted by Teets on a branch of Pleasant Creek, 2.2 miles northeast of Berryburg, where its blossom occurs in the public road at an elevation of 1380′ B. At **Coal Exposure No. 203 on Map II,** on the head of Taylor Drain, 0.8 mile north of Switzer, it was noted by Teets at an elevation of 1495′ B., being 0′ 6″ thick. **At Coal Exposure No. 204 on Map II,** on the head of Beechlick Run of Elk, 1.4 miles northwest of Simons, it is recorded 1 foot thick, as shown by the Beech Lick Section, page 89.

The following exposure was reported by Teets:

Coal Exposure—No. 205 on Map II.

On Left Branch of Gnatty Creek, 1.7 miles northeast of Century; **Normantown Coal**; elevation, 1215′ B.

	Ft.	In.
Slate		
Coal	1	3
Slate		

In Upshur County the horizon of the Normantown Coal was noted by Teets along a private road 1.2 miles north of Buckhannon, where it is represented by 2 feet of dark shale, at an elevation of 1500′ B.

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[9] Lewis-Gilmer Report, W. Va. Geol. Survey, p. 143; 1916.

CLARKSBURG RED SHALE.

The Clarksburg Red Shale of Hennen and the writer[16] occurs generally in Barbour and Upshur where its horizon is exposed. It is usually composed of two distinct bands of red shale, each of which is 25 to 40 feet thick, separated by the Lower Connellsville Sandstone. The section for Colebank, Cove District, Barbour, published on page 101, illustrates well the relationship of these formations, both bands of reds as well as the two Connellsville Sandstones being represented. In the section for Meadowville, Glade District, published on page 107, the upper streak of reds is 70 feet thick and the lower is 25 feet. In Chapter IV the reds are noted also in the section for Pepper, Elk District, and for Turkey Run, in Warren District, Upshur. There is a good exposure of the upper part of these reds in the Smith Cut on the Baltimore and Ohio Railroad, just south of Pecks Run Station, in Upshur, where the following section was made by Teets and the writer, the thicknesses being estimated in the steep sides of the cut:

	Feet.
Shale, sandy	10
Sandstone, massive, gray, Connellsville	15
Shale, red, with limestone nodules, Clarksburg Reds	25
Sandstone	2
Shale, red, with limestone	3
Shale, dark, carbonaceous streak	...
Shale, gray	2
Sandstone, shaly, to grade (1462′ L.)	5

These two bands of red shale, when not carrying too many limestone nodules, would make excellent material for brick either for building or paving purposes. The great economy with which they can be quarried and manufactured into brick at many convenient points in either county would probably warrant their use for general paving purposes, even though a standard test might not show as good results as could be obtained from high-grade fire bricks imported from other counties.

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[16] Doddridge-Harrison Report, W. Va. Geol. Survey, p. 240; 1912.

MORGANTOWN SANDSTONE.

The Morgantown Sandstone, of J. J. Stevenson, named from its occurrence at Morgantown, West Virginia, occurring just under the lower division of the Clarksburg Red Shale, and having its base about 250 feet below the Pittsburgh Coal, can be found generally throughout Barbour and Upshur in the region of its crop. It is usually greenish-gray on fresh fracture, but weathering to brown, massive and micaceous, varying in thickness from 10 to 30 feet, and sometimes having quartz pebbles. In western Barbour it was noted by Teets at Clemtown, 15 feet thick; on Cunningham Run, 20 feet thick and pebbly; at Pepper, 10 feet thick, making a cliff; on Stewart Run, 10 feet thick and massive; at Overfield, 20 feet thick and forming a cliff; near Simons, 20 feet thick and massive. In eastern Barbour it was noted by the writer at Colebank, 25 feet thick and brown; at Meadowville, 25 feet thick and shaly; at Flora, 23 feet thick, brown and flaggy. In Upshur it was noted by the writer on Hackers Creek at the road fork just west of Ruraldale where it is 20 feet thick and massive; the Groundhog Hollow Section of Chapter IV records it 15 feet thick; it is reported by Teets 30 feet thick and massive near the Macedonia Church and in the region of Fishingcamp Station; it is also prominent along the railroad cuts between Fishing Camp and the Smith Cut, directly overlying the Elk Lick Coal; and it is recorded in the section for Cutright Run, 16 feet thick.

No quarries were observed on this ledge in either county but in many of the localities noted above it could be used for rough masonry construction or for concrete aggregate, but its use for ornamental purposes would not prove satisfactory.

ORLANDO LIMESTONE.

The Orlando Limestone of the writer[11], lying between the Morgantown Sandstone and Elk Lick Coal, and being usually shaly and varying in thickness from 2 to 4 feet, was observed at several points, mostly in Upshur. A few fresh-water fossil forms were noticed in a few localities, fish teeth and **Naiadites elongata** being predominant. In Barbour this limestone was observed by Teets in Elk District, along a branch of Elk Creek, 1 mile northwest of Elk City, where it is shaly and nodular, at an elevation of 1225′ B. In Upshur several exposures of this limestone were found by the writer in the neighborhood of Buckhannon and in the region southwestward toward Lewis. The following exposure was observed in the public road at the head of Fall Run of Spruce, 0.4 mile southwest of Atlas:

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[11] Lewis and Gilmer Report, W. Va. Geol. Survey, p. 147; 1916.

	Feet.
Sandstone, gray, Morgantown	...
Shale, variegated	15
Limestone, dark, containing fish teeth (1370′ B.)	0½
Shale, gray	1
Slate, dark, streak	...
Shale, gray	2
Limestone, dark, hard	1
Concealed and variegated shale	40

At another point 0.3 mile northwest of the point just mentioned, the limestone was observed on the land of **Marcellus Reger**, being 4 feet thick and brecciated, having an elevation of 1355′ B., and coming 35 feet above an opening in the Elk Lick Coal.

The following exposure was observed in the public road on a branch of Glady Fork, 1.2 miles due south of Atlas:

	Feet.
Sandstone	...
Shale, sandy	10
Limestone, hard, gray, Orlando	2
Coal, (1′ 6″), Elk Lick (1445′ B.) (Exposure No. 240 on Map IV)	1½
Shale, sandy	10
Sandstone, massive, Grafton	...

The following exposure was noted in the Leonard Cut along the Baltimore and Ohio Railroad, 1.4 miles northeast of Buckhannon:

	Feet.
Sandstone, massive, Morgantown	10
Shale, gray, limy	15
Limestone, shaly, with some iron sulphide, Orlando	5
Coal, Elk Lick (1445′ B.), 1′ 0″ to	3
Shale, gray, limy, to grade	15

In Banks District the limestone was observed on the head of Whites Camp, 0.8 mile eastward from Boyd, where it was 2 feet thick and brecciated, at an elevation of 1800′ B.

The Orlando Limestone is of value chiefly as a soil-maker, being usually too shaly for agricultural purposes or for road material.

ELK LICK COAL.

The Elk Lick Coal of the First Geological Survey of Pennsylvania, belonging a short distance under the Morgantown Sandstone and immediately under the Orlando Limestone, and about 265 feet below the Pittsburgh Coal, is represented fairly well in both counties and has been mined commercially. Its outcrop in these regions where it is of possible minable thickness, is shown on Maps II and IV, and its distribution, chemical character, together with detailed bed-sections, will be discussed fully in Chapter XI.

ELK LICK LIMESTONE.

The Elk Lick Limestone of Messrs. Platt[12], occurring a few feet below the Elk Lick Coal, was found at some localities in the two counties, but is not of general occurrence. Its usual appearance is gray and hard and it contains fresh-water fossils of microscopic size, and the thickness varies from 1 to 6 feet. In Barbour several exposures of the lime were noted by Teets. At Overfield, Elk District, it crops in the public road at an elevation of 1040′ B., being 2′ 6″ thick, and has been burned for agricultural purposes by J. C. Benson. The following section was noted on Stewart Run of Elk, 1.8 miles northwest of Elk City:

	Feet.
Shale, sandy	
Limestone, hard, impure, Elk Lick (1080′ B.)	6
Shale, red, limy	10

A sample was collected here for analysis the composition of which is reported as follows by Messrs. Hite and Krak:

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[12] Report HHH, Second Geol. Survey of Penna.

	Per cent.
Silica (SiO_2)	4.97
Ferric Iron (Fe_2O_3) and Alumina (Al_2O_3)	2.52
Calcium Carbonate ($CaCO_3$)	86.15
Magnesium Carbonate ($MgCO_3$)	4.66
Phosphoric Acid (P_2O_5)	0.10
Loss on ignition	0.68
Total	99 08

One-half mile farther up Stewart Run and 2 miles northwest of Elk City, the limestone was found again, at an elevation of 1080′ B., being 2 feet thick.

In Upshur, the limestone was noted along the Baltimore and Ohio Railroad grade 0.2 mile northwest of Fishing Camp Station, where it was shaly and coming 10 feet below the Elk Lick Coal. It was also observed by Teets along the Buckhannon River, 0.2 mile northwest of Post Mills, where it was found to be 0′ 11″ thick, impure and nodular, on the **Isaac Post Heirs farm,** coming 15 feet below an opening in the Elk Lick Coal, and having an elevation of 1440′ B.

WEST MILFORD COAL.

The West Milford Coal of Hennen[13], coming immediately under the Elk Lick Limestone, was observed at a few localities but is not a persistent horizon. At **Coal Exposure No. 251 on Map II,** on Elk Creek, 1.3 miles northwest of Elk City, it appears in the road, at an elevation of 1090′ B., being 0′ 6″ thick. Its blossom was also observed by the writer in Cove District, Barbour, in the public road, 1.4 miles northeast of Cove Run Station, at an elevation of 1730′ B., being 20 feet below the Elk Lick Coal. It may be disregarded entirely as an economic horizon.

BIRMINGHAM SHALE.

The Birmingham Shale of Stevenson[14], consisting of red, sandy, and variegated shales, and belonging between the West Milford Coal and the Grafton Sandstone, and often being largely replaced by the latter horizon, may be noted at frequent points where its horizon outcrops, but as it has little scientific or economic importance it deserves no discussion.

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[13] Ray V. Hennen, Doddridge-Harrison Report, W. Va. Geol. Survey, p. 246; 1912.

[14] J. J. Stevenson, Report K, Sec. Geol. Survey of Penna., pp. 79 and 309-310.

GRAFTON SANDSTONE.

The Grafton Sandstone of White[15], named from its occurrence at Grafton, West Virginia, and usually having its base about 310 feet below the Pittsburgh Coal, was frequently observed in both counties. It is usually hard, massive, and brown, often carrying quartz pebbles, but at many points it is shaly and soft. Lithologically, it bears a strong resemblance to the Saltsburg Sandstone, belonging about 100 feet lower in the measures, and presents much the same appearance when used for structural purposes. In Chapter IV it is noted in the Barbour sections for Elk City, massive, buff, and 33 feet thick; at Colebank, 24 feet thick and shaly; at Nestorville, 30 feet thick, hard and brown; and at Moatsville, 25 thick, brown and pebbly. It was noted by Teets at several points west of the Tygart Valley in Barbour, being 20 feet thick and flaggy in the public road 2.2 miles northeast of Berryburg, on the waters of Pleasant Creek, where its elevation was 1315′ B. Near the head of Rockcamp Run, one-half mile west of Clemtown, it makes a massive cliff at an elevation of 1745′ B., and one mile northeast of Clemtown, it is 10 feet thick and massive, at an elevation of 1830′ B. One mile northwest of Foxhall, it is visible in the public road, being massive, medium-coarse, 20 feet thick, and having an elevation of 1545′ B. One mile northeast of Moatsville, on the east side of the Tygart Valley, it was observed in the public road, making a massive cliff rock, at an elevation of 1670′ B.

In Upshur the Grafton Sandstone is prominent in the neighborhood of the Macedonia Church and School, about one-half mile northeast of Fishing Camp Station, Warren District, where, according to Teets, it has been quarried for chimneys and cellars, being massive and pebbly and coming a short distance below the Elk Lick Coal. At the spring in Hart Grove at the southwest edge of Buckhannon, it was identified by Teets and the writer, being massive and pebbly, and having an elevation of 1460′ B. At Rocky Ford, on Glady Creek, it forms the floor of the creek and road, the elevation of its top being 1405′ L., and on the head of Cutright Run, 1.1 miles northwest of Hinkleville, it was noted at an elevation of 1600′ B., being 60 feet below the Elk Lick Coal, massive and 20 feet thick.

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[15] I. C. White, Vol. II, W. Va. Geol. Survey, p. 255; 1903.

At the **D. D. T. Farnsworth Heirs quarry**, at the east end of Buckhannon and immediately east of Farnsworth millrace, the following exposure was noted:

	Feet.
Sandstone, massive, gray, Grafton	15
Slate, dark, Harlem Coal horizon (1425′ B.)	0½
Fire clay shale, gray	5
Concealed to river	17

Here the stone is gray on fresh fracture, but weathering to brown, and presents an irregular, broken appearance, having been quarried many years ago, presumably for the foundation of the mill and the bridge abutments near by. The quarry is about 100 feet long and extends into the hill 15 feet.

Northeast of the last-named locality, the sandstone makes a bluff at several points on the east side of the Buckhannon River, the following hand-level measurement being made a short distance south of the Leonard Cut:

	Feet.
Coal opening, abandoned, Elk Lick (1495′ B.)	...
Shale, yellow, and concealed	17
Sandstone, massive, brown, Grafton	34
Concealed	15
Shale, green, partly concealed, Ames	10
Coal, Harlem, (1′ 0″ visible) (1418′ B.) (Exposure No. 273 on Map IV)	1
Shale, gray, partly concealed, to Buckhannon River	25

In Banks District, the Grafton Sandstone was observed on the head of Whites Camp, 0.9 mile east of Boyd, where it is massive and 25 feet thick, coming 6 feet above a dark shale that represents the Harlem Coal, the elevation of the latter being 1435′ B.

In both counties the Grafton Sandstone should furnish a good quality of building stone for general purposes. It is easily worked and durable, and its brown texture, giving a pleasing appearance, makes it suitable for architectural purposes.

AMES LIMESTONE AND SHALE.

The Ames Limestone, first named and described by Andrews of the Ohio Geological Survey, and later subdivided by Hennen[16] into the **Upper Ames Limestone, Ames Shale** and **Lower Ames Limestone,** all of which carry marine fossil shells in West Virginia, occurs frequently in both Barbour and Upshur. In these counties the group does not preserve the typical development of Harrison and other northern counties but usually consists of green fossiliferous shale with occasional nuggets of lime at the top or bottom, the thickness of the entire deposit varying from 5 to 20 feet. Except as a soil-maker the group has no economic importance, but its position in the measures, being about 325 feet below the Pittsburgh Coal, and about 300 feet above the Upper Freeport, coupled with its characteristic green color and abundant fossil fauna make it an exceptionally important member for stratigraphic work.

In Barbour the Ames crops in a long narrow belt west of the Tygart Valley River, starting with the Upshur Line and extending northeastward to the neighborhood of Clemtown and Cove Run where the rapid general northward dip of the measures flattens out the structure so that the Ames may be found at numerous points eastward across the Tygart Valley until in the Belington Syncline in the eastern part of the county its crop becomes general and extends southward to Belington. In Upshur the crop of the Ames extends southwestward from Volga through Buckhannon and Frenchton to the Lewis County Line, the belt that contains it being three or four miles wide.

Numerous sections, showing the Ames, will be given along with the description of the Harlem Coal.

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[16] Ray V. Hennen, Doddridge-Harrison Report, W. Va. Geol. Survey, p. 250; 1912.

HARLEM COAL.

The Harlem Coal of Newberry[17], belonging just under the Ames Limestone and Shale, and about 325 feet below the Pittsburgh Coal, is a persistent seam, the region of its outcrop being identical with that of the Ames Limestone outlined above. It is too thin for commercial mining, but has often been dug out for local fuel at points favorable for stripping, the thickness varying from 1 to 2 feet of clean coal free from slate partings. Its outcrop is not shown on Maps II and IV, but it lies about 60 feet below the Elk Lick and about 100 feet above the Bakerstown Coal, the outcrops of both of which are shown on the maps, so that its position may be readily interpolated at any point.

In Pleasant District, Barbour, the coal was noted by Teets at several points. At **Coal Exposure No. 252 on Map II,** on Pleasant Creek at the cross roads 2.8 miles northward from Berryburg, it was 1′ 0″ thick, having an elevation of 1168′ L. At **Coal Exposure No. 253 on Map II,** on the head of Cunningham Run, just southeast of Clemtown, the coal was 1′ 3″ thick, at an elevation of 1745′ B. The following exposure shows its relation to the Ames Shale:

Coal Exposure—No. 254 on Map II.

On a bronch of Foxgrape Run at Switzer; **Harlem Coal**; elevation, 1385′ B.

	Ft.	In.
Shale, greenish-red, with marine fossils, Ames	...	..
Coal, Harlem	1	9
Shale	...	..

At **Coal Exposure No. 255 on Map II,** in Union District, on the head of Elk Creek, 1.6 miles northwest of Malta, the coal is 1′ 1″ thick, as observed by Teets, coming just below the fossiliferous Ames Shale, at an elevation of 1425′ B. The three following exposures were noted by the writer in the same region:

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[17] J. S. Newberry, Bull. Geol. Soc. of America, Vol. 17, p. 156; 1906

Coal Exposure—No. 256 on Map II.

On the ridge, 1.1 miles west of Malta; **Harlem Coal**; elevation, 1570′ B.

	Ft.	In.
Shale, green, fossiliferous, **Ames**	..	..
Coal, Harlem	1	0
Shale, red and variegated, **Pittsburgh**	..	..

Coal Exposure—No. 257 on Map II.

In the public road, 1.2 miles northeast of Volga; **Harlem Coal**; elevation, 1525′ B.

	Ft.	In.
Shale, green, **Ames**	..	..
Limestone, hard, fossiliferous, **Lower Ames**	0	6
Coal, Harlem	1	6
Shale, variegated, **Pittsburgh**	..	..

Coal Exposure—No. 258 on Map II.

On Wash Run, 0.6 mile north of Volga; **Harlem Coal**; elevation, 1435′ B.

	Ft.	In.
Shale, green, fossiliferous, **Ames**	15	0
Coal, Harlem	1	6
Shale, variegated, **Pittsburgh**	..	..

At **Coal Exposure No. 259 on Map II**, on Wash Run, 1.1 miles north of Volga, Teets observed 1′ 6″ of coal, at an elevation of 1445′ B., coming under the fossiliferous Ames Shale.

At the **Clinton Reger Opening (No. 260 on Map II)**, on a branch of Big Run, 0.5 mile west of Volga, the coal was once stripped for local use, at an elevation of 1430′ B., but the place had fallen shut when visited by Teets.

At **Coal Exposure No. 261 on Map II**, in the public road 0.5 mile south of Volga, the coal was 1′ 5″ thick, at an elevation of 1515′ B., as noted by Teets, coming just below the fossiliferous Ames Shale.

At **Coal Exposure No. 262 on Map II**, in the public road, 0.7 mile south of Volga, a measurement made by Teets showed 1′ 7″ of coal, at an elevation of 1570′ B.

In Cove District the Harlem Coal was observed by the writer at numerous points. At **Coal Exposure No. 263 on Map II**, on Oldroad Run, 2.1 miles south of Dent, the coal had once been mined along the public road, at an elevation of 1540′ B., coming just under the fossiliferous Ames Shale, but the place had fallen shut and its thickness was not obtained.

At **Coal Exposure No. 264 on Map II,** on Sandy Creek, 0.8 mile west of Colebank, the Harlem had once been mined, as shown by the Section for Colebank, page 101, but the place had fallen shut.

At **Coal Exposure No. 265 on Map II,** on Big Cove Run, 1.4 miles southwest of Colebank, the coal was 1 foot thick, at an elevation of 1540′ B.

In the Danville Section, published on page 104, the coal is represented by a blossom, and at **Coal Exposure No. 266 on Map II,** at the head of Stony Run, 1.1 miles northeast of Cove Run Station, it was 1 foot thick, at an elevation of 1645′ B., coming just under the fossiliferous **Ames Shale.**

In the Nestorville Section, published on page 104, the blossom of the coal shows in the public road, and at the **N. C. Poling Opening (No. 267 on Map II),** 1.3 miles eastward from Kalamazoo, it was reported 1′ 6″ thick, coming just under the fossiliferous Ames Shale, at an elevation of 1725′ B. In the Belington Section, published on page 112, it is represented by a blossom.

In Upshur the Harlem Coal has much the same appearance and thickness as in Barbour. At **Coal Exposure No. 268 on Map IV,** in the public road on Pecks Run 0.3 mile east of Teter Station, it was observed at an elevation of 1435′ B., being about 1 foot thick and coming just below the fossiliferous Ames Shale.

At **Coal Exposure No. 269 on Map IV,** in the public road, 0.7 mile southward from Teter Station, Teets found it to be 1′ 1″ thick, coming at an elevation of 1490′ B.

The following exposure was noted along the Baltimore and Ohio Railroad grade:

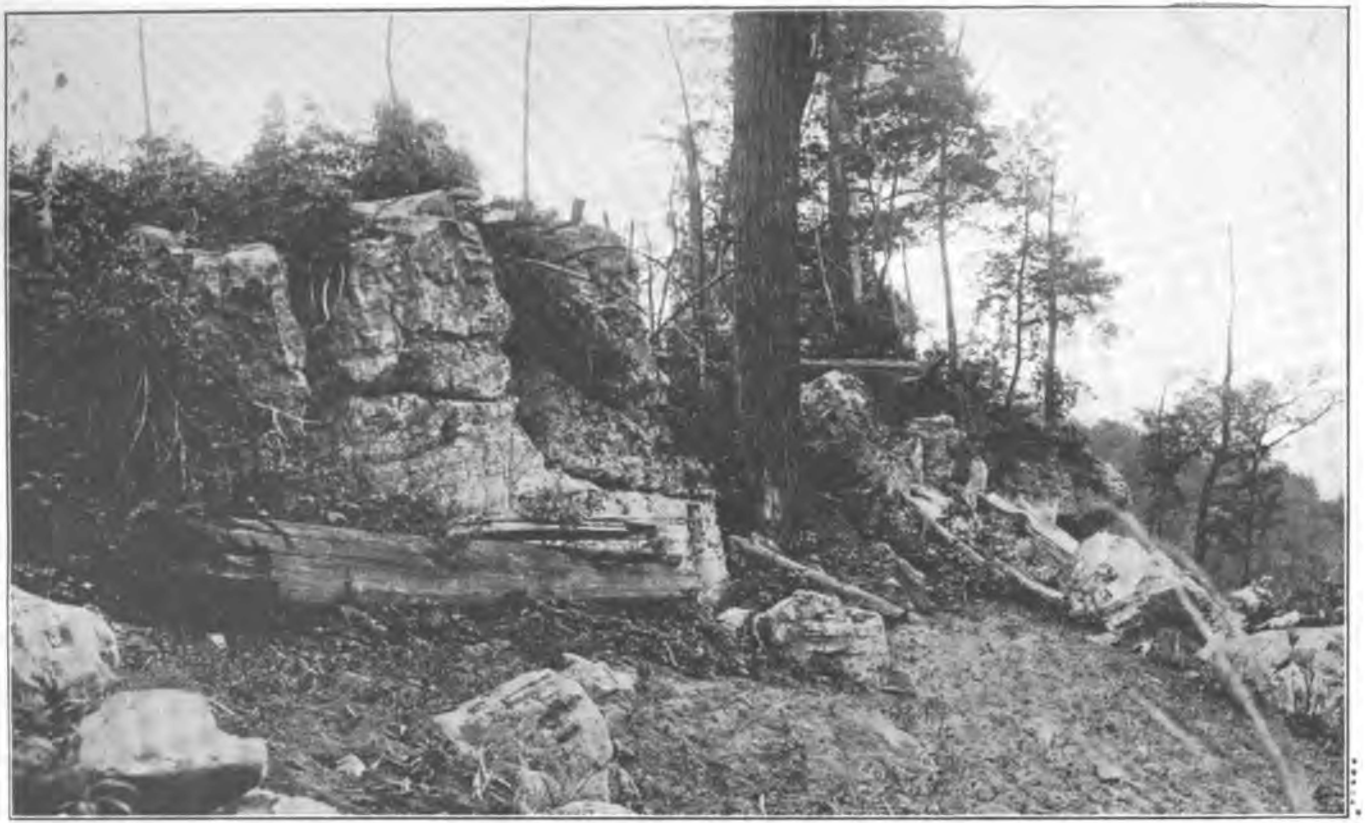

PLATE XIV.—Mahoning Sandstone cliff, 1.2 miles east of Audra, Barbour County, showing typical weathering.

Coal Exposure—No. 270 on Map IV.

On a branch of the Buckhannon River, 0.3 mile south of Fishingcamp Station; **Harlem Coal**; elevation, 1435′ B.

		Ft.	In.
Sandstone fragments, **Grafton**		..	..
Shale, dark-green, with limestone nodules, **Ames**		10	0
Limestone, dark, shaly, with marine fossils, mostly **brachiopoda, Lower Ames**		1	0
Slate, black		0	6
Coal	0′ 10″		
Slate, dark	0 2		
Coal	1 4	2	4
Shale, gray, to grade			

At **Coal Exposure No. 271 on Map IV,** in the public road at Post Mill Station, the coal was observed at an elevation of 1423′ L., being 1 foot thick.

At **Coal Exposure No. 272 on Map IV,** in Union District, 0.7 mile northwest of Hinkle, Teets observed 2 feet of Harlem Coal in the public road, at an elevation of 1765′ B.

At **Coal Exposure No. 273 on Map IV,** on the Buckhannon River just south of the Leonard Cut and about 1.3 miles northeast of Buckhannon, the Harlem Coal was found to be 1′ 0″ thick, coming just below the Ames Shale, as shown in a section given on page 220 under the description of the Grafton Sandstone.

In Meade District at the village of Abbott, Mrs. E. A. Cutright reports that a seam of coal 4 feet thick was found in a well on her property, the same now being owned by J. J. Green. This coal would have an elevation of 1480′ B., and would represent the Harlem, although its thickness has probably been exaggerated by the drillers.

The following exposure was noted in the same locality:

Coal Exposure—No. 274 on Map IV.

On Pringle Fork of Stonecoal Creek, 0.6 mile northwest of Abbott; **Harlem Coal**; elevation, 1440′ B.

	Ft.	In.
Shale, sandy		
Coal, slaty, Harlem	2	0
Shale, gray	25	0
Sandstone, massive, **Jane Lew**	10	0
Shale, variegated and limy, **Pittsburgh Reds**	..	..

JANE LEW SANDSTONE.

The Jane Lew Sandstone of the writer[18], separated from the Harlem Coal by only a few feet of shale, was found at a few localities, although it is not generally present. It is usually shaly, but sometimes develops into a hard, massive cliff, varying from 10 to 25 feet in thickness. In Barbour it has its greatest thickness at Belington, where, as published in the Belington Section, page 112, it forms a cliff, 28 feet thick, and separated from the Harlem Coal by 17 feet of red shale, that represents the upper portion of the Pittsburgh Reds, and being 25 feet above the top of the Saltsburg Sandstone.

In Upshur the sandstone was observed at several points in Buckhannon and Meade Districts. On the lefthand branch of Lick Run, 1.3 miles eastward from Rocky Ford, it appears in the road, being 10 feet thick, at an elevation of 1455′ B. On the head of Cutright Run, 1.1 miles northwest of Hinkleville, it was 10 feet thick, at an elevation of 1550′, being 100 feet below the Elk Lick Coal. On the head of Pringle Fork of Stonecoal, northwest of Abbott, it makes a cliff, about 10 feet thick and coming a short distance below the Harlem Coal as shown by the section at Coal Exposure No. 274 on Map IV published on page 225. In Banks District it appears in the Frenchton Section, published on page 147, being represented by 10 feet of sandy shale. On Whites Camp, 1.7 miles southwest of Rock Cave, it is 10 feet thick, and shaly, coming 164 feet by hand-level above the Brush Creek Coal and fossiliferous Brush Creek Shale.

As an economic deposit, this sandstone is generally worthless, being too soft and shaly for building material, but on Pringle Fork of Stonecoal it is much harder than usual and could possibly be used locally with fair results.

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[18] Lewis and Gilmer Report, W. Va. Geol. Survey, p. 153; 1916.

PITTSBURGH RED SHALE.

The **Pittsburgh Red Shale** of White[19], lying between the Harlem Coal and Saltsburg Sandstone, and often composed of two portions separated by the Jane Lew Sandstone, occurs generally where its horizon is found above drainage in the two counties. In the upper portion, next to the Harlem Coal, there is usually 10 to 15 feet of yellowish-gray shale, often containing nuggets of lime which, in some counties, thicken into a lenticular deposit known as the Ewing Limestone, but which was not observed in Upshur and Barbour. Below this yellow shale the member assumes a deep-red tinge that continues to the Jane Lew Sandstone. Below this sandstone the lower portion of the Pittsburgh Shale is usually a deep-red all the way to the Saltsburg Sandstone. The entire group, comprising the yellow shale at the top, the Jane Lew Sandstone, and the two bands of red, varies in thickness from 40 to 75 feet. Its outcrop is practically coincident with that outlined for the Ames Limestone and Harlem Coal above. Economically, the Pittsburgh Red Shale is a valuable material for making brick, either for building or paving purposes, having been used extensively at several points in the State.

SALTSBURG SANDSTONE.

The Saltsburg Sandstone of J. J. Stevenson, belonging below the Pittsburgh Reds and just above the Bakerstown Coal, may be found generally throughout both counties in the region of its outcrop. It is nearly always massive, being sometimes gray on fresh fracture, but usually mottled with iron peroxide spots giving it a brown texture, and is hard and coarse, being often conglomeratic. In Barbour it was noted by Teets in Pleasant District, at a point along the public road 0.3 mile southwest of Pleasant Creek village, where it was 15 feet thick, at an elevation of 1270' B., and also at another point, 1.4 miles northeast of Arden, where it was 15 feet thick and massive, having an elevation of 1720' B. In the Elk City Section, on page 89, it is recorded 33 feet thick, and in that for Philippi, page 97, it is 28 feet, coming at the top of the hill just southwest of the town. It is recorded again by Teets in Philippi District on a branch of Hackers Creek, 2 miles southwest of Berryburg Junction, where it is 20 feet thick and massive, at an elevation of 1410′ B. In Cove District it is recorded in the section for Danville, published on page 104, being 28 feet thick; and in Barker it is noted in the Belington Section, page 112, where it is 30 feet thick, and shaly.

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[19] I. C. White, Bull. 65. U. S. G. S., p. 92; 1891.

In Upshur it is a well-marked horizon in Buckhannon District, being just at drainage at the Star Mill in Buckhannon town, where 4 feet of the top is exposed at water-level.

At the **Montaville Reger Heirs Quarry**, located along the Baltimore and Ohio Railroad, just north of Tenerton Station, 15 feet of the upper portion of the ledge is exposed, the elevation of its top being 1445′ B. Here the stone is massive, coarse, only medium-hard, and mottled with spots of iron peroxide. The quarry is 75 feet long and extends into the hill 30 feet.

Another exposure just south of Tenerton Station and north of the Belgrade Glass factory, shows the following:

	Feet.
Sandstone, massive, brown, Saltsburg	30
Fire clay shale to grade, **Bakerstown Coal** horizon (1425′ B.)	5
Concealed	3
Sandstone, masive, **Buffalo**, to Buckhannon River	15

The Saltsburg Sandstone is well exposed on the land of **Jackson Brothers**, starting at the point between Stony Run and the Buckhannon River and extending southwestward for nearly a mile. Here the stone is covered by only a slight deposit of soil and could be quarried at minimum expense, the valley of Stony Run affording a natural grade for a railroad switch, while the amount of stone available would be practically unlimited. The characteristic brown texture of the Saltsburg makes it an ideal one for architectural purposes.

East of the Buckhannon River in Union District, large quantities of the Saltsburg Sandstone have been quarried and hauled by wagon into Buckhannon for building purposes. Many of these building blocks were split from loose boulders lying on the ground in the fields east of the Poe Bridge, being the remnants of what was once a massive ledge. Along the Parkersburg and Staunton Turnpike in the vicinity of Reger, the stone is well exposed and boulders from it have been used extensively. The Hinkle Section, on page 129, shows it to be massive and 23 feet thick.

The **George Miller Quarry,** located on Childers Run, 1.1 miles north of Reger, shows 20 feet of sandstone, at an elevation of 1430′ B., according to Teets, being pink, buff or brown in color, massive and medium-coarse. The quarry is 100 feet long and extends 30 feet into the hill, the stone having been used by the Baltimore and Ohio Railroad for the piers and abutments of the bridge at Post Mill.

In Banks District the Saltsburg is recorded in the Cow Run Section on page 149, being massive and 30 feet thick, which is typical of its character in that region.

The outcrop of the Saltsburg Sandstone in the two counties may be determined with great certainty from the outcrop of the Bakerstown Coal which is shown on Map II, the stone being usually found immediately over the coal. As a building stone for general purposes it is the most desirable horizon found in either county.

BAKERSTOWN COAL.

The **Bakerstown Coal** of White[20], coming just under the Saltsburg Sandstone and about 425 feet below the Pittsburgh Coal, is a persistent and valuable seam in northeastern Barbour, having been mined extensively for local use. Its crop in those regions where it is of minable thickness is shown on Map II, and its thickness, and chemical character, together with many detailed bed sections will be given in Chapter XI, under the subject of "Coal".

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[20] I. C. White, Report Q, Sec. Geol. Survey of Penna.

PINE CREEK LIMESTONE.

The Pine Creek Limestone of White[21], coming 30 to 40 feet below the Bakerstown Coal, and frequently having abundant marine fossil forms in the northern counties of the State, is of scanty occurrence in the territory of this report. In Barbour it was not noted, but in southern Upshur it was found at a few localities. In Buckhannon District it was observed on Right Fork of Stonecoal Creek, 1.2 miles southwest of Atlas, where it is 1 foot thick and siliceous, coming 40 feet below the Bakerstown Coal, and contains scanty marine fossils, according to Dr. Price, the details having been published in a previous report[22]. In Washington District it was noted by Teets in the public road, 1 mile southeast of Tenerton, being 1 foot thick and having an elevation of 1600′ B. In Banks District it was noted along the Coal and Coke Railway grade, 0.8 mile southwest of Frenchton, where it is siliceous, 0′ 6″ thick, and comes 15 feet below the Bakerstown Coal, as previously published in the Lewis and Gilmer Report, page 156.

BUFFALO SANDSTONE.

The Buffalo Sandstone of White[23], belonging about 100 feet below the Bakerstown Coal, is found generally in the region of its outcrop in both counties, being usually gray and massive and frequently carrying quartz pebbles, the thickness of the stratum varying from 20 to 50 feet. In Union District, Barbour, it has been quarried in the hill northwest of Hall Post-Office, where, according to Teets, it is massive, brown and pebbly, 10 feet of the ledge being exposed. It was used by the Baltimore and Ohio Railroad for bridge abutments at Hall Station. In Philippi District it makes a prominent cliff at the head of Elk, 0.9 mile west of Lillian, being 30 feet thick, gray and pebbly, at an elevation of 1530′ B. In the Philippi Section, published on page 97, it is noted 50 feet thick and massive.

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[21] I. C. White, Report Q, Sec. Geol. Survey of Penna.

[22] Lewis and Gilmer Report, W. Va., Geol. Survey, pp. 156 and 623; 1916.

[23] I. C. White, Report Q, Sec. Geol. Survey of Penna.

At the **Broaddus College Quarry,** located just northwest of Philippi, the sandstone is massive, buff, and medium-coarse, according to Teets, 12 feet of it being exposed at an elevation of 1500′ B. The quarry is 100 feet long and extends into the hill 30 feet, and the stone was used for general building purposes.

Just east of the Olive Hill School, the Buffalo was noted 30′ thick, at an elevation of 1880′ B., and about one-half mile west of the schoolhouse it makes a great cliff on the tops of the ridges. In Cove District, it makes a massive cliff at numerous points along Sandy Creek between Dent and Colebank, and makes a massive, pebbly cliff, 25 feet thick, along Raccoon Creek, 1 mile southwest of Danville, and also forms a massive cliff along Brushy Fork of Teter Creek, 1 mile northeast of Nestorville, as shown by the section for that place on page 104. In Glade District it is a prominent ledge at the schoolhouse just south of Meadowville, as recorded in the section for that place, page 107, and farther south at Flora the section records it 45 feet thick, being just above drainage. In Barker District it is exposed at numerous points along the road between Huffman and Belington, being a great massive, pebbly ledge. Just northwest of Belington at the city limits it forms a prominent ledge along the Baltimore and Ohio Railroad, as recorded in the section for Belington, page 112.

In Upshur County the Buffalo appears in the Buckhannon River at the Poe Bridge in South Buckhannon where the top is exposed above drainage. On Cutright Run it forms a cliff 30 feet thick on the land of Wm. Snyder, and at the head of Crooked Run, one-half mile south of Hinkleville it is 30 feet thick, and massive. In Union District it is a massive ledge along the Parkersburg and Staunton Turnpike, 0.9 mile northwest of Overhill, and at this point ripple-marks were noted on its top by the writer, the tidal elevation being 1740′ B. In Meade District it is a massive ledge along the French Creek Turnpike, 0.4 mile north of Adrian, its elevation being 1590′ B In Washington District it is reported by Teets as a massive cliff at several points between Hampton and Ivy. In Banks District it makes a massive ledge on Whites Camp, 1.7 miles southwest of Rock Cave, and in the sections for Arlington and Cow Run, published in Chapter IV, it is noted 28 feet and 35 feet thick, respectively.

Economically, the Buffalo Sandstone lacks the pleasing texture that characterizes the Saltsburg above it, making it not so desirable for architectural purposes, but its abundant exposure and massive, durable qualities should make it a valuable quarry rock for structures where beauty is not essential.

BRUSH CREEK LIMESTONE AND SHALE.

The Brush Creek Limestone of White[24] and the **Brush Creek Shale** of Hennen[25], occupying about 10 feet of the measures between the Buffalo Sandstone and Brush Creek Coal, were observed at numerous points along their outcrop in both counties. The Limestone is a dark, carbonaceous, lenticular deposit, being seldom more than a few inches in thickness, and often absent entirely. When present it usually contains marine fossils in profusion, Crinoid stems and Gastropods being common forms. The shale is of common occurrence, being dark and fissile and usually containing marine fossils of the same kind as those found in the limestone. Its most extensive outcrop is along a straight belt, 40 miles long, starting at Hiram, at the Barbour-Taylor Line and extending southwestward across Barbour and Upshur, practically coincident with the line of junction between the green and red structure contours shown on Maps II and IV, and varying in width from 1 to 4 or 5 miles, and lying just west of Philippi, just south of Buckhannon and passing by way of Rock Cave to the Lewis County Line. Along the Belington Syncline in eastern Barbour the shale may be found again on both sides of the syncline and also at points along the axis between Meadowville and Belington.

Economically, the Brush Creek Shale is of no interest as it contains too much siliceous and carbonaceous material to be of value for brickmaking. The limestone, when present, adds to the fertility of the soil, but is not otherwise valuable.

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[24] I. C. White, Report Q, Sec. Geol. Survey of Penna.

[25] Ray V. Hennen, Monongalia-Marion-Taylor Report, W. Va. G. S., p. 310; 1913.

Numerous sections, showing the Brush Creek Limestone and Shale in relation to the members of the series above and below, will be given under the description of the Brush Creek Coal next following.

BRUSH CREEK COAL.

The Brush Creek Coal of White[26], belonging directly under the Brush Creek Limestone and Shale, and being 500 to 525 feet below the Pittsburgh Coal, and 250 to 300 feet above the Lower Kittanning, is of wide-spread occurrence in both Barbour and Upshur in the regions outlined above for the Brush Creek Limestone and Shale, but is always too thin for commercial mining, being usually not more than 1 foot thick, and often much less than that figure. It is a valuable stratigraphic horizon because of its persistent occurrence, and has been used locally for domestic fuel at various points where other coal could not be conveniently had.

At **Coal Exposure No. 326 on Map II,** in Union District, Barbour, 1 mile southeast of Volga, Teets observed 2 feet of coal in the public road, at an elevation of 1530′ B.

At **Coal Exposure No. 327 on Map II,** in Glade District, on Flat Run, 1 mile east of Tacy, the coal had once been prospected at an elevation of 1485′, and was reported 1′ 6″ thick, but the place had fallen shut and this statement could not be verified.

At **Coal Exposure No. 328 on Map II,** on a branch of Glady Creek, 1.6 miles northeast of Meadowville, the coal had once been mined by stripping, at an elevation of 1605′ B., but the place had fallen shut and the thickness was not secured.

At **Coal Prospect No. 329 on Map II,** on Glady Creek, 0.5 mile west of Kirt, the coal was once opened at an elevation of 1755′ B., but the place had fallen shut and its thickness was not obtained.

At **Coal Prospect No. 330 on Map II,** on Mud Gut Run, 1.8 miles northeast of Flora, the coal was once mined by stripping, at an elevation of 1680′ B., but the place had fallen shut and could not be measured.

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[26] I. C. White, Report Q, Sec. Geol. Survey of Penna.

At **Coal Exposure No. 331 on Map II,** in Barker District, along the ridge road, 1.5 miles southward from Calhoun, Teets measured 1′ 1″ of coal, at an elevation of 1980′ B.

At **Coal Prospect No. 332 on Map II,** on Bills Creek, 1.7 miles northwest of Flora, the coal was once mined by stripping at an elevation of 1730′ B., but the place was abandoned and the thickness could not be secured.

In Warren District, Upshur, the following exposure was noted by Teets, showing both the shale and the coal:

Coal Exposure—No. 333 on Map IV.

Near the Buckhannon River, 1.4 miles northwest of Hinkle; **Brush Creek Coal**; elevation, 1470′ B.

	Ft.	In.
Shale, gray, visible	4	0
Shale, dark	1	6
Shale, pinkish and dark, with marine fossils, Brush Creek	0	6
Coal, slaty and cannelly, Brush Creek	2	0
Shale, slate and fire clay	5	6
Shale, carboniferous	2	0
Shale, sandy	..	..

The following section was measured in Buckhannon District along the Baltimore and Ohio Railroad grade:

Coal Exposure—No. 334 on Map IV.

Along the Buckhannon River, 0.9 mile south of Tenerton; **Brush Creek Coal**; elevation, 1420′ B.

			Ft.	In.
Sandstone, massive, Buffalo			..	..
Shale, sandy and dark, with marine fossils, Brush Creek			15	0
Coal	0′	8″		
Shale, gray	0	3		
Coal	0	4	1	3
Fire clay to grade				

This exposure was once examined by Dr. White, who mentions having found **Chonetes mesolobus, Productus nebrascensis,** a species of **Bellerophon,** and many **Crinoid** fragments[27], the Brush Creek Limestone and Shale at that time being commonly called the Lower Cambridge, a title that was later discarded.

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[27] I. C. White, Vol. II, W. Va. Geol. Survey, p. 279; 1903.

Two other exposures in the same region showed the following:

Coal Exposure—No. 335 on Map IV.

On Cutright Run, 1.1 miles northeast of Hinkleville; **Brush Creek Coal**; elevation, 1510′ B.

	Ft.	In.
Shale, dark, with plant fossils, **Brush Creek**.....	15	0
Coal, **Brush Creek**...........................	2	0
Fire clay....................................	5	0

Coal Exposure—No. 336 on Map IV.

On Crooked Run, 0.5 mile south of Hinkleville; **Brush Creek Coal**; elevation, 1560′ B.

	Ft.	In.
Sandstone, massive, **Buffalo**..................	30	0
Fire clay and slate...........................	1	0
Coal, slaty, **Brush Creek**......................	1	0
Fire clay shale..............................	6	0

In Union District the two following exposures were noted by Teets:

Coal Exposure—No. 337 on Map IV.

Along the ridge road, 1.1 miles east of Hinkle; **Brush Creek Coal**; elevation, 1905′ B.

	Ft.	In.
Shale, yellow.................................		
Shale, pink..................................	0	4
Slate, cannel.................................	0	9
Coal, **Brush Creek**...........................	0	6
Fire clay....................................		

Coal Exposure—No. 338 on Map IV.

On the head of Childers Run, 1.2 miles northeast of Reger; **Brush Creek Coal**; elevation, 1650′ B.

	Ft.	In.
Shale, pinkish-gray, **Brush Creek**................		
Coal, impure, **Brush Creek**....................	1	9
Fire clay and slate...........................		

One-half mile farther southeast Teets found the marine fossils in the shale over a slaty deposit that represented the Brush Creek Coal.

A very good exposure of the Brush Creek Shale appears at the following:

Coal Exposure—No. 339 on Map IV.

On Sand Run, 0.5 mile southwest of Overhill; **Brush Creek Coal**; elevation, 1775′ B.

	Ft.	In.
Shale, dark, sandy	5	0
Shale, dark-gray, with marine fossils, Crinoids, Gastropods, etc., **Brush Creek**	1	0
Coal, Brush Creek	1	0

In the northern part of Meade District the coal was observed at numerous points, among which were the following:

A. D. Page Coal Exposure—No. 340 on Map IV.

On Morgan Run, 1 mile southwest of Adrian; **Brush Creek Coal**; elevation, 1592′ B.

	Ft.	In.
Sandstone, massive, **Buffalo**		
Coal, Brush Creek	1	8
Slate, pavement		

At this exposure the Brush Creek was found to be 87 feet. by hand-level, above the Upper Freeport Coal, which crops in the hollow below.

Coal Exposure—No. 341 on Map IV.

In the public road on Slab Camp Fork, 1.1 miles northwest of French Creek; **Brush Creek Coal**; elevation, 1450′ B.

	Ft.	In.
Sandstone, massive, **Buffalo**	...	..
Shale, dark, sandy	15	0
Shale, black, with gastropods and pelecypods, **Brush Creek**	0	6
Coal, mostly slate, Brush Creek	2	0
Fire clay shale	5	0

At **Coal Exposure No. 342 on Map IV,** on Mulberry Ridge, 1.3 miles southwest of French Creek, the coal is exposed in the public road, at an elevation of 1645′ B., being about 2 feet thick.

At **Coal Exposure No. 343 on Map IV,** on the ridge road, 1.5 miles due south of French Creek, the coal is 1 foot thick, at an elevation of 1725′ B., coming under 15 feet of dark, sandy shale that represents the Brush Creek.

Coal Exposure—No. 344 on Map IV.

On the ridge road, 1.3 miles west of Evergreen; **Brush Creek Coal;** elevation, 1835′ B.

	Ft.	In.
Shale, dark, sandy, with concretions and one pelecypod noted, **Brush Creek**	5	0
Coal and slate, Brush Creek	1	6

In Washington District Teets reports the coal at **Exposure No. 345 on Map IV,** on the ridge road at the head of Gravel Run, 2 miles southeast of Ours Mill, one foot thick and slaty, at an elevation of 1995′ B.

The following exposure was noted in Banks District:

G. B. Brake Coal Prospect—No. 346 on Map IV.

On Whites Camp, 1.8 miles southwest of Rock Cave; **Brush Creek Coal;** elevation, 1569′ B.

	Ft.	In.
Sandstone, massive, **Buffalo**	35	0
Concealed	5	0
Shale, dark, with abundant marine fossils, Crinoids, Gastropods, Chonetes, etc., **Brush Creek**	10	0
Coal, slaty, Brush Creek	1	0

This coal prospect comes 59 feet, by hand-level, above the mouth of the G. B. Brake Core Test (No. 104 on Map IV), the record of which could not be obtained. The Brush Creek Shale at this point exhibited the greatest abundance of fossil forms noted anywhere in the two counties.

MAHONING SANDSTONE STAGE.

The Mahoning Sandstone Stage of H. D. Rogers and White[27], occurring between the Brush Creek and Upper Freeport Coals, is represented in Upshur and Barbour by the following members:

Upper Mahoning Sandstone.
Mahoning Coal.
Thornton Fire Clay .
Lower Mahoning Sandstone .

Mahoning Sandstones.—The Mahoning Sandstones comprise the great bulk of the Mahoning Stage, usually forming massive, gray ledges 25 to 40 feet in thickness, each, or sometimes being consolidated into one ledge, 50 feet or more in thickness. Both members frequently carry quartz pebbles, but these are often lacking. When pulverized, the sandstone usually has about the appearance of coarsely ground corn-meal, a characteristic that is typical of these members in many of the northern counties. The Upper Mahoning was noted by Teets at several points just west of Tygart Valley River in Barbour. Along the hill road, three-fourths mile northeast of Arden it had once been quarried for building purposes, at an elevation of 1605′ B. Just west of Philippi it was noted, and on the east side of the river in the vicinity of Lillian and Calhoun it occurs at numerous points. In Union and Washington Districts, Upshur, it is noted near Wentz Ford, Hinkle, Tallmansville, and Ivy. In Banks District, it occurs as a massive pebbly ledge, 60 feet thick, in the top of the mountain north of Cleveland, as shown by the section for that place, page 153.

The Lower Mahoning is noted in Barbour near Arden, Philippi, Tygart Junction, Lillian, Vannoys Mill, Nestorville, Valley Furnace and Belington. In Upshur, it is prominent, in the vicinity of Wentz Ford, Hinkle, Tenmile, Ivy and Cow Run.

The Jonah Denham Quarry, located at Mansfield, Philippi District, Barbour, shows a great pebbly, pinkish-gray ledge, making a prominent cliff around the hillside, 20 feet of it being visible at an elevation of 1445′ B., at the place where it is quarried. Stone from this quarry has recently been used for the foundation of the new woolen mill at Philippi.

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[27] I. C. White, Vol. II, W. Va. Geol. Survey, p. 305; 1903.

The **D. T. Malcolm Quarry,** located on a branch of Shooks Run, one-mile west of Philippi, and due north of the Denham quarry, shows a hard gray pebbly cliff, of which 15 feet of the upper portion has been quarried, the elevation of its top being 1420' B. The quarry-face is 150 feet long and it extends into the hill 40 feet. The joint-planes of the ledge are irregular, making it somewhat difficult to quarry large blocks, but the stone is hard and firm, and makes good material for massive masonry. It has been used for the construction of the Byrer Building in Philippi.

Numerous exposures of the Mahoning Sandstones will be given along with the detailed description of mines in the Upper Freeport Coal in Chapter XI, to which reference is made for further information.

Mahoning Coal.—The Mahoning Coal of White[28], belonging just under the Upper Mahoning Sandstone, was observed as a blossom, only, at a few points. Teets records it in Warren District, Upshur, 1.8 miles southwest of Hall, at an elevation of 1600' B., and again in Washington District of the same county, 0.5 mile southwest of Ivy, its elevation being 1820' B.

Thornton Fire Clay.—The Thornton Fire Clay of White[29], coming just under the Mahoning Coal, was noted in Barbour at a point 1.5 miles southeast of Belington, as described in Chapter XIII under the subject of "Clay", and appears in the measures at a few points in Upshur. In the section for Evergreen, Meade District, a fire clay shale, 15 feet thick, and plastic, was found just over what seems to be the Lower Mahoning Sandstone, and this would represent the Thornton. In Washington District Teets records it in the public road, 1.1 miles west of Ivy, being 5 to 7 feet thick, at an elevation of 1720' B., and again in the road 1 mile west of Goodwin, 5 feet thick, at an elevation of 1880' B. In the section for Stillman, on page 150, it is recorded just over the Lower Mahoning Sandstone, 15 feet thick, and plastic. In the section for Cleveland, on page 153, its presence is noted, but the thickness was not obtained.

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[28] I. C. White, Bull. 65, U. S. G. Survey, p. 94; 1891.
[29] I. C. White, Vol. II, W. Va. Geol. Survey, pp. 322-323; 1903.

UFFINGTON SHALE.

The Uffington Shale of White[80], coming between the Lower Mahoning Sandstone and Upper Freeport Coal, being usually dark-gray and siliceous, with abundant plant remains, and having plant fossils at its type locality in Monongalia County, was noted at various points. In Philippi District, Barbour, the following exposure was observed on the ridge at the head of Sand Run, 2 miles southeast of Vannoys Mill:

	Feet.
Sandstone, massive, pebbly, makes haystack pillars, on ridge, Lower Mahoning...........................	35
Shale, dark, sandy, Uffington (1860' B.)..................	2

One mile east of Valley Furnace, it was noted 10 feet thick, coming between the Mahoning Sandstone and Upper Freeport Coal, at the opening on the Andrew Miller farm. The section for Nestorville, page 104, records it 5 feet thick.

Other exposures of the Uffington Shale will be noted along with the detailed sections of the Upper Freeport Coal in Chapter XI.

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[80] I. C. White, Vol. II, W. Va. Geol. Survey, p. 323; 1903.

CHAPTER VII.

STRATIGRAPHY—THE ALLEGHENY SERIES.

GENERAL DESCRIPTION AND SECTION.

The Allegheny Series of the Pennsylvanian Rocks, described and named by the First Geological Survey of Pennsylvania from its occurrence along the river of the same name in that State, outcrops over a considerable area of central, eastern and southern Barbour, as shown by Map II; and throughout a broad belt southwestward across Upshur and in the western corner of Randolph, as shown by Map IV. The series begins with the top of the Upper Freeport Coal and extends downward to the top of the great Homewood Sandstone of the Pottsville, being usually about 250 feet thick, and composed largely of gray sandstones and gray sandy shales, weathering into a yellow sandy soil entirely different from that resulting from the Conemaugh red beds above. Besides several small seams of coal, of local importance only, the series contains four good seams of minable thickness, one of which, the Lower Kittanning, has been mined for many years on an extensive scale in Barbour and Randolph. There are no limestones of economic importance, but valuable seams of flint or plastic fire clay are found under several of the coals, most of them being somewhat lenticular in their occurrence.

The following general section, compiled from the sections published in Chapter IV, as well as from numerous other detailed observations, shows the Allegheny Series for the three counties:

General Section of the Allegheny Series for Barbour, Upshur and the Western Portion of Randolph Counties.

	Thickness. Feet.	Total. Feet.	
Coal, **Upper Freeport**	5	5	5′
Fire clay, **Bolivar**	6	11	
Limestone, **Upper Freeport**, (not usually found)	2	13	
Sandstone, massive, gray, **Upper Freeport**	35	48	
Coal, **Lower Freeport**	2	50	45′
Fire clay and shale	13	63	
Limestone, **Lower Freeport** (not usually found)	2	65	
Sandstone, massive, gray, **Lower Freeport**	40	105	
Coal, **Upper Kittanning**	5	110	60′
Fire clay, **Upper Kittanning**	5	115	
Limestone, **Johnstown Cement**	4	119	
Fire clay, **Hardman**	4	123	
Sandstone, massive, gray, **East Lynn**	35	158	
Coal, **Middle Kittanning**	4	162	52′
Sandstone, gray (often represented by sandy shale)	10	172	
Coal, **Lower Kittanning**	8	180	18′
Fire clay, **Lower Kittanning**	5	185	
Shale, sandy	13	198	
Sandstone, flaggy, **Clarion** (often not found)	30	228	
Coal, **Clarion** (often not found)	2	230	50′
Shale, sandy	20	250	
Sandstone, massive, **Homewood** (top of **Pottsville**)	...	...	

The Clarion Sandstone and Clarion Coal are often entirely absent, leaving the Lower Kittanning Coal separated from the Homewood Sandstone by only 10 to 20 feet of fire clay and sandy shale. Many of the other members are absent or thin over wide areas, as will be fully discussed in the subsequent pages of this chapter.

DESCRIPTION OF MEMBERS.

UPPER FREEPORT COAL.

The Upper Freeport Coal of the First Geological Survey of Pennsylvania, lying at the top of the Allegheny Series, is found in portions of Barbour where it is mined for local domestic fuel and is mined commercially in Upshur. The bed section differs somewhat from that found in northern West Virginia, but the character of the coal is much the same. Its areal extent, character and thickness, and chemical quality, together with detailed bed sections will be discussed in Chapter XI, under the subject of "Coal."

BOLIVAR FIRE CLAY.

The Bolivar Fire Clay, first named and described by Pennsylvania geologists from its occurrence near the town of that name in Westmoreland County, Pa., where it is used for making fire brick, was observed at a few points in Barbour and Upshur, although it is not abundant. In the section for Colebank, Cove District, Barbour, it was recorded 2′ 5″ thick, and in the same District it was noted on Brushy Fork of Teter Creek, 1.3 miles northeast of Valley Furnace, being flinty, ferriferous and 25 feet thick, and coming just under the Upper Freeport Coal. The ferriferous nodules were formerly dug from this clay and used in an old furnace which will be described in Chapter XIII under the subject of "Iron Ore".

In Upshur it was noted by Teets in Union District along the public road just south of Five Forks at an elevation of 1940′ B., the thickness not being determined, and also along the public road in the neighborhood of Nebo Schoolhouse in the same District. In the section for French Creek, published on page 133, it is recorded as being 25 feet thick where it crops along the public road 0.6 mile south of the village. In the Sago Section, page 134, it is noted 10 feet thick, as exposed in the public road near the railroad tunnel. It was also noted in the public road at the head of Indian Camp, 0.6 mile northwest of Beans Mill, being 5 feet thick at an elevation of 2090′ B.

It is possible that at a few of these localities named, the clay might be of some value for making brick, though it is doubtful if it is pure enough to stand a high refractory test.

UPPER FREEPORT LIMESTONE.

The Upper Freeport Limestone, named by the First Geological Survey of Pennsylvania from its occurrence in the same locality as the Freeport Coals, was not observed as a separate horizon in the territory of this report, although in the region of Valley Furnace, Cove District, Barbour, ferruginous limestone nodules are found in the Bolivar Fire Clay, that probably represent its horizon, but it appears to be represented in a boring at Buckhannon where it is in two layers, separated by 4½ feet of shales.

UPPER FREEPORT SANDSTONE.

The Upper Freeport Sandstone, named by Pennsylvania geologists from its occurrence in that State, and usually belonging only a few feet below the Upper Freeport Coal, is usually a massive cliff-forming horizon in both Barbour and Upshur, its color being gray. In Barbour it was noted in Union District just north of Century Junction, cropping along the Baltimore and Ohio Railroad grade and being 30 feet thick, and massive. In the section for Hall, on page 94, it is noted as being 9 feet thick, ferriferous and pebbly. It was noted by Teets at numerous points in the region east of the Tygart Valley River, being 25 feet thick a short distance northeast of Lillian; 20 feet thick and flaggy, at an elevation of 1810′ B., at a point 1 mile northeast of Mt. Liberty; 15 feet thick and pebbly ½ mile south of Calhoun, the elevation being 1795′ B. In the section for Belington, page 112, it is 35′ 10″ thick and in that for Junior, page 115, it is 20 feet thick.

In Upshur it is noted in the Turkey Run Section, page 123, as being 70 feet thick, which is an unusual figure, and it is recorded as 48 feet thick in the boring at Buckhannon on page 128.

The **Nutter & Core Quarry,** located on the west side of the Buckhannon River just north of the village of Hampton, Buckhannon District, is in the Upper Freeport ledge, as is clearly shown by the presence of an old opening in the Upper Freeport Coal just above it, at an elevation of 1450′ B. The quarry has been partly filled up with debris, but about 10 feet of the ledge is still visible, being massive, gray, coarse and hard, with numerous particles of mica. Stone from it was used in Buckhannon in the basements of the present courthouse and jail, with satisfactory results.

In the Sago Section, page 134, the stone is noted 63 feet thick, where it crops along the public road north of the railroad tunnel. In Union District it was noted by Teets at several points. On Sand Run, 2 miles east of Reger, it was massive, pebbly and 40 feet thick; just southwest of Swamp Run it formed a massive cliff rock, at an elevation of 2070′ B.; and in the Overhill Section, page 131, its thickness was noted as 30 feet. In Meade District it forms a great massive cliff rock just under the Upper Freeport Coal in the neighborhood of Adrian, varying from 25 to 50 feet in thickness, and visible at numerous points around the village. It is also prominent just beneath the same coal around the village of French Creek, being a hard resistant formation, and usually carrying quartz pebbles. On the head of Grandcamp Run, 0.7 mile southwest of the Indian Camp School, it was noted 50 feet thick and massive, its top being at an elevation of 2135′ B. In the section for Evergreen, page 133, it is noted 30 feet thick. East of the Buckhannon River it was noted by Teets at several points in Washington District, being 10 to 15 feet thick, massive and having an elevation of 1890′ B. at the head of Gravel Run. In Banks District it appears along the Little Kanawha River 1 mile northeast of Gaines, having an elevation of 1990′ B., and being soft and pebbly.

The massive and durable character of this sandstone should make it a valuable one for structures where large building blocks are desired.

LOWER FREEPORT COAL.

The Lower Freeport Coal, of the First Geological Survey of Pennsylvania, belonging about 50 feet below the Upper Freeport, is not well developed in Barbour and Upshur, being seldom more than two feet thick and often represented by nothing more than a little black slate or being absent entirel It will furnish local fuel in a few places, but may be disregarded as a commercial deposit.

At **Exposure No. 455 on Map II,** in Pleasant District, Barbour, 0.7 mile northeast of Arden, Teets records 0′ 8″ of coal at an elevation of 1480′ B., and at **Exposure No. 456 on Map II,** 0.6 mile northeast of Arden it was 1′ 6″ thick, at an elevation of 1500′ B. At **Mine No. 457 on Map II,** on the Tygart Valley River, 0.6 mile north of Berryburg Junction, the coal is 1′ 9″ thick, with partings, as shown by the section for that place, page 83. At the following opening there is a considerable amount of coal, but it is badly mixed with slate.

B. E. McCoy Farm Mine—No. 458 on Map II.

On the Tygart Valley River, 1.3 miles east of Volga; Lower Freeport Coal; elevation, 1435′ B.

			Ft.	In.
Slate, black			1	0
Coal	2′	6″		
Slate, black	0	2		
Coal	0	6		
Slate, bony	1	3		
Coal	1	0		
Shale, gray	0	7		
Coal	2	0	8	0
Concealed, by water and fire clay to massive sandstone			2	0

The thickness of coal shown at the above opening is unusual for the Lower Freeport in this locality, but it is only 35 feet below an opening in the Upper Freeport, and the correlation seems sure.

At **Opening No. 459 on Map II,** on a branch of the Tygart Valley River, 1.2 miles northwest of Middle Fork Station, the place had fallen shut when visited by Teets, but the thickness of the coal was estimated at about 3 feet, its elevation being 1730′ B.

In the same District the coal was also noted by Teets at **Exposure No. 460 on Map II,** along the public road 0.9 mile north of Audra, at an elevation of 1860′ B.

The **Joseph Sandridge Farm Mine, No. 461 on Map II** on the head of Lick Shoals Run, 0.6 mile northwest of Audra, with an elevation of 1868′ L., had fallen shut and its thickness was not obtained by Teets when he examined the opening.

At **Opening No. 462 on Map II,** 0.3 mile northwest of Audra, the place had fallen shut when examined by Teets, but was reported as being 3 feet thick, its elevation being 1910′ B., as noted in the Audra Section, page 95.

In Philippi District, the coal was once opened at the **Grafton Fuel Company Prospect, No. 463 on Map II,** along the Tygart Valley River hill just east of the Lillian Mines, at an elevation of 1491′ L., the thickness being reported 3 to 4 feet with a parting by W. S. Brydon, Superintendent, the prospect being 75 feet by hand-level, above the base of the Upper Kittanning Coal.

At **Exposure No. 464 on Map II,** on Shooks Run, 0.4 mile west of Philippi, 2′ 0″ of clean coal was visible at an elevation of 1350′ B.

In Cove District the coal was once opened at the **Jasper England Prospect, No. 465 on Map II,** along the east side of the Tygart Valley River, 1.2 miles southwest of Moatsville, at an elevation of 1455′ B., but not much coal was found.

The coal was once opened at **Prospect No. 466 on Map II,** along the hill road, 0.3 mile northeastward from Moatsville village, at an elevation of 1365′ B., but the place had fallen shut when examined and the thickness of the coal was not obtained.

In Glade District the coal is visible at **Exposure No. 467 on Map II,** in the public road along a branch of Glady Creek, 1.2 miles northeast of Vannoys Mill, its elevation being 1600′ B. The heavy blossom would indicate 1 to 2 feet of coal.

In the section for Meadowville, on page 107, 0′ 8″ of Lower Freeport Coal is noted in the boring that forms the lower part of the section.

In Upshur few exposures of this coal were seen. Its blossom appears in the public road just east of Hampton, but there is little coal.

In Union District, it was observed by Teets at the **Isaac Moats Opening, No. 468 on Map IV,** on a branch of Middle Fork River at Swamp Run, being 3′ 1″ thick, and having an elevation of 1935′ B. A sample was collected at this opening, the composition of which is published under **Mine No. 468** in the table of coal analyses at the end of this chapter.

On Little Sand Run it was found by Teets along the public road at **Exposure No. 469 on Map IV,** 1.3 miles northwest of Ivy, where it was 0′ 6″ thick, at an elevation of 1470′ B.

At **Exposure No. 470 on Map IV, 0.8 mile southwest** of Vegan, 1′ 2″ of coal was visible along the public road, at an elevation of 1995′ B.

In Meade District it was observed in the village of French Creek, at **Exposure No. 471 on Map IV,** where its blossom is exposed in the public road, at an elevation of 1480′ B., being separated from the Upper Freeport Coal, 40 feet above it, by the massive Upper Freeport **Sandstone.**

In Washington District it was observed by Teets at a few points, as follows:

Marion Dean Farm Mine—No. 472 on Map IV.

On Sand Run, 1.4 miles south of Overhill; **Lower Freeport Coal;** elevation, 1745′ B.

	Ft.	In.
Shale roof	..	..
Coal, soft	3	6
Slate	..	..

Ed Glass Farm Mine—No. 473 on Map IV.

On the head of Grassy Run, 0.8 mile west of Goodwin; **Lower Freeport Coal;** elevation, 1784′ L.

			Ft.	In.
Coal	0′	7″		
Slate, black	0	1		
Coal, medium-hard	1	8		
Coal, bony	1	0		
Coal, medium-hard	0	10		
Slate or bone	0	3		
Coal	0	9		
Coal, bony	0	6	5	8
Slate			..	..

At Tenmile, the horizon of the Lower Freeport was prospected, as shown by the section for that place, page 138, but apparently little or no coal was found.

In Banks District the blossom of the coal was observed along the hill road 1.8 miles northeast of Cleveland, as shown by the section for Honey Camp, page 154, but elsewhere it was not found.

LOWER FREEPORT LIMESTONE.

The Lower Freeport Limestone, of the Pennsylvania geologists, belonging only a few feet below the Lower Freeport Coal, is not usually found in Barbour and Upshur, being noted at only a few points, where it is a thin, gray stratum. It contains no marine fossils, but in some counties shows small brackish-water types of shells.

In Barbour it is noted in the coal boring that composes the

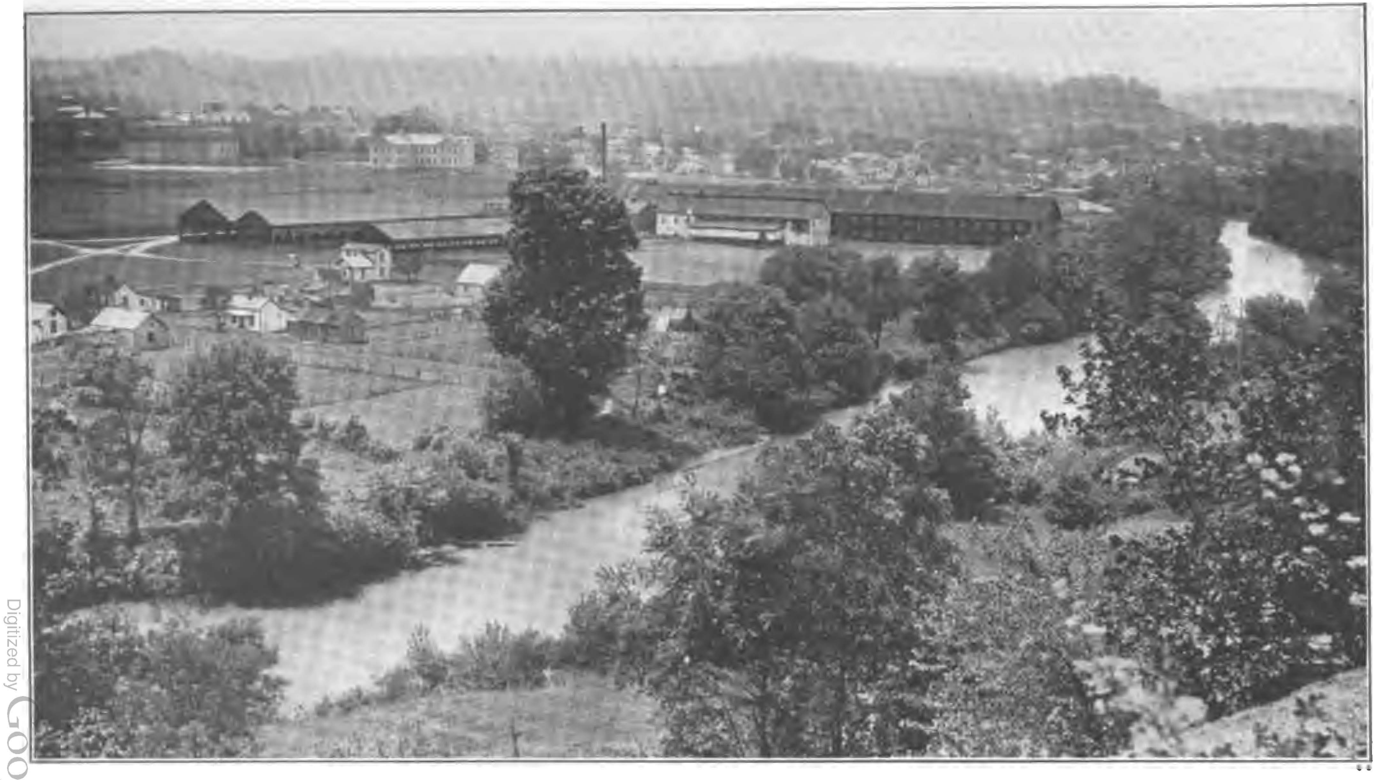

PLATE XV.—View of Buckhannon looking west, with Buckhannon River in foreground, Wesleyan College at left, and Flaccus tannery in center; Topography of Conemaugh Series.

lower part of the Colebank Section, published on page 101, and is 1 foot thick.

The following exposure was noted along the public road on Teter Creek, Cove District, 1.4 miles north of Nestorville:

	Ft.	In.
Sandstone, shaly..............................		
Coal, streak, Lower Freeport (1325′ B.).........		
Shale, with ferruginous limestone nodules, Lower Freeport	5	0

In the Meadowville Section, page 107, the limestone is noted 0′ 6″ thick, in the boring that was used for the underground portion of the section.

The **P. S. Combs Quarry,** located on Bills Creek, Barker District, 1.8 miles northeast of Calhoun, had fallen shut when it was examined, but fragments of ferruginous limestone were visible on the dump. Residents reported that the limestone occurred in the form of boulders bedded in shale and that it was used for agricultural purposes with very good results. The quarry is at an elevation of 1665′ B., being 50 feet below the undoubted bench of the Upper Freeport Coal so that the correlation seems certain. A sample was collected for analysis, the composition of which is reported by Hite and Krak as follows:

	Per cent.
Silica (SiO_2)..	19.47
Ferric Iron (Fe_2O_3) Alumina (Al_2O_3)..	11.76
Calcium Carbonate ($CaCO_3$)........................	63.36
Magnesium Carbonate ($MgCO_3$)....................	1.67
Phosphoric Acid (P_2O_5)............................	0.09
Loss on ignition..	3.16
Total	99.51

Economically, the scarcity of exposures indicates that the Lower Freeport Limestone is not of appreciable value.

LOWER FREEPORT SANDSTONE.

The Lower Freeport Sandstone of the Pennsylvania geologists, described as being composed of two separate divisions, belongs a short distance under the Lower Freeport Limestone, and since that stratum does not generally occur in Barbour and Upshur, it is found in these counties only a

few feet below the Lower Freeport Coal. In tracing this sandstone across West Virginia, it has been found that another name has been applied to the Lower Division; hence it has seemed well to abandon the titles "Lower Freeport, Upper Division", and "Lower Freeport, Lower Division", previously used in the reports of the northern counties, and to apply the name "Lower Freeport Sandstone" to the upper stratum, only, using the name for the lower formation that has been applied to it in the southern counties of the State.

The Lower Freeport Sandstone, as it occurs in the territory of this report, is a massive, gray deposit, often 40 to 50 feet in thickness and sometimes carrying quartz pebbles. In Barbour it is recorded in the shaft record of the Midland Coal & Coke Company, north of Berryburg Junction, 27 feet thick as appears in the section for that place, page 83, where this record was used.

The **Baltimore and Ohio Railroad Quarry,** located on the east side of the Buckhannon River at the mouth of Pecks Run, near Hall Station, at an elevation of 1405′ B., is apparently on this ledge. Here the stone is massive and gray, but somewhat soft. The quarry-face is 30 feet long, 15 feet high and extends into the hill 20 feet, and the stone was used for the abutments of the railroad bridge near the quarry.

In Philippi District the stone crops at numerous points. Along the east side of the Tygart Valley River, 1.3 miles south of Philippi, it is 20 feet thick, massive and pebbly, standing out in a bold ledge, the elevation of its top being 1480′ B. It is reported by Teets 1.4 miles northwest of Calhoun, being 25 feet thick, at an elevation of 1730′ B. On the head of Anglins Run, 2.5 miles southeast of Philippi, it is a massive, pebbly stratum, 50 feet thick, the elevation of its base being 1690′ B. One mile northeast of Mt. Liberty, as noted by Teets, it is 15 feet thick, with an elevation of 1800′ B. On the head of Fords Run, 2 miles southeast of Philippi, it is 40 feet thick, massive and pebbly, the elevation of its top being 1645′ B.

In Cove District it is recorded in the section for Colebank, page 101, being 43 feet thick, as determined by the coal boring that composes the lower portion of the section. In the section for Nestorville, page 104, it is noted in a boring as being 23 feet thick.

In Glade District it is noted in the boring that makes the lower part of the Meadowville Section, page 107, as being 10′ 6″ thick. On a branch of Sugar Creek, 1.3 miles southwest of Vannoys Mill, it appears as a massive, pebbly stratum, the elevation of its top being 1725′ B.

In Barker District it is recorded in the boring that forms the lower portion of the section for Belington, page 112, as being 27′ 10″ thick, the boring itself being in Valley District.

At Hampton in Upshur, the top of the Lower Freeport ledge is visible on the east side of the Buckhannon River at the end of the highway bridge, 15 feet of it being visible above drainage, and coming only a few feet below the blossom of the Lower Freeport Coal. One-half mile southeast of Hampton the ledge crops along the railroad grade, making a great massive, pebbly cliff, 50 feet thick, with numerous plant fossils at its base, among which Sigillariae and other forms were noted, its elevation being 1440′ B., and the slate and shale that represent the Upper Kittanning Coal being visible at its base.

In Banks District it is recorded in the section for Cleveland, page 153, being 35 feet thick, and in that for Honey Camp, page 154, it is 55 feet thick.

In Randolph it is noted in Roaring Creek District in the section for Findley, page 164, where it is 25 feet thick, and massive, and in that for Leiter, page 165, where it is 25 feet thick, and pebbly.

This sandstone horizon could furnish an enormous amount of good stone for general masonry or bridge purposes.

UPPER KITTANNING COAL.

The Upper Kittanning Coal, named by Messrs. Platt and Lesley, from its occurrence in Pennsylvania, and belonging just below the Lower Freeport Sandstone, and from 90 to 125 feet below the Upper Freeport Coal, and 50 to 100 feet above the Lower Kittanning, is found at numerous points in both Barbour and Upshur, forming a valuable fuel resource. Its outcrop is shown on Maps II and IV and its character, thickness and extent, together with detailed bed sections, will be fully discussed in Chapter XI, under the subject of "Coal".

UPPER KITTANNING FIRE CLAY.

The **Upper Kittanning Fire Clay** of Hennen[1], belonging just under the Upper Kittanning Coal, was observed at a few points in Upshur County, but was not noted in Barbour. In Meade District it is recorded in the section for French Creek, page 133, being 2 feet thick, as exposed at the southern end of the village. In the public road just west of Sago a bed of flinty clay, 14 feet thick, is exposed, coming 89 feet above the Lower Kittanning Coal and 93 feet below the Upper Freeport, that probably represents the Upper Kittanning, but the same deposit does not appear at the railroad tunnel a few hundred feet to the southward, nor in such thickness at any other point in the county, hence it must be considered a lenticular formation.

At Imperial, Meade District, the Upper Kittanning Fire Clay is exposed just over the sand quarry of the Imperial Sand Company, being 3 feet thick and coming between the Upper Kittanning Coal and the Upper East Lynn Sandstone, as shown in the section for Imperial on page 136. Here the clay was sampled by F. G. Smith of Buckhannon who has kindly furnished the Survey with a copy of the analysis, as made by the Pittsburgh Testing Laboratory under sample number 45988 over the signature of H. H. Craver, Chief Clerk. The same exposure was sampled by the writer and analyzed by Hite and Krak in the Survey Laboratory. The two analyses are as follows:

	Pittsburgh Testing Laboratory	W. V. G. S.
	Per cent.	Per cent.
Silica (SiO_2)	64.56	73.40
Alumina (Al_2O_3)	21.55	14.69
Iron Oxide	2.71	2.28
Titanic Acid (TiO_2)	1.40	1.06
Lime (CaO)	0.07	0.80
Magnesia (MgO)	0.60	0.46
Loss on ignition	6.26	3.60
Potassium Oxide (K_2O)	.....	2.11
Sodium Oxide (Na_2O)	.....	1.10
Phosphoric Acid (P_2O_5)	.....	0.14
Alkalies	2.74	......
Moisture	.....	0.67
Totals	99.89	100.31

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[1] Ray V. Hennen, Monongalia-Marion-Taylor Report, W. Va., Geol. Survey, p. 344; 1913.

On Queens Fork of Little Kanawha River, 1.7 miles northwest of Alton, 10 feet of plastic fire clay is visible in the public road just under the blossom of the Upper Kittanning Coal, the elevation of which latter formation is 1970′ B., and this must represent the Upper Kittanning Clay.

JOHNSTOWN CEMENT LIMESTONE.

The Johnstown Cement Limestone, named by Franklin Platt from its occurrence in Cambria County, Pa., and coming just under the Upper Kittanning Fire Clay, and often just under the Upper Kittanning Coal when the clay is lacking, is not of general occurrence in the territory of this report, but is found at a few points in both Upshur and Barbour, and at one or two places has been burned for agricultural lime.

In Barbour it is exposed in Union District at several points along the Baltimore and Ohio Railroad between Hall Station and the Upshur County Line, varying in thickness from 1 to 4 feet and usually being hard and siliceous. The following exposure was observed just southwest of Hall Station:

	Thickness. Feet.	Total. Feet.
Sandstone, masive, in bluff, Mahoning	...	...
Concealed	15	15
Coal, Upper Freeport, thickness concealed	...	...
Concealed	70	85
Coal streak, Upper Kittanning (1410′ B.)	...	...
Limestone, shaly, Johnstown	4	89
Fire clay, with flinty fracture	10	99
Sandstone, to grade	4	103

The following section, measured with aneroid, along the north side of the Buckhannon River, 0.3 mile northwest of Boulder, illustrates the relationship of the Johnstown Limestone to other Allegheny formations:

Boulder Section, Union District, Barbour.

	Thickness. Feet.	Total. Feet.
Concealed from summit, mostly sandy shale	70	70
Coal blossom, Upper Freeport (1585′ B.)	...	70
Shale, sandy, partly concealed	65	135
Sandstone, shaly, Lower Freeport	30	165

	Thickness. Feet.	Total. Feet.
Concealed and shale, Upper Kittanning Coal horizon	3	168
Limestone, hard, Johnstown	2	170
Concealed, with fire clay, Hardman	15	185
Sandstone, massive, East Lynn	45	230
Concealed, sandy shale, sandstone and fire clay to railroad grade	35	265
Concealed to Buckhannon River	25	290

In Philippi District the limestone is visible along the west side of the Tygart Valley River just south of Philippi, being represented by ferruginous limestone nodules bedded in shale, as shown by the Philippi Section, page 97. At the Meriden mines the limestone is visible, being 2 feet thick and coming 4½ feet below the Upper Kittanning Coal, which is opened in the hill just north of the main mine in the Lower Kittanning.

The following exposure was noted along the railroad grade 0.3 mile north of Meriden:

	Feet.
Coal, Upper Kittanning (1325′) B.) about	4
Fire clay and shale	3
Sandstone, massive	10
Slate, black, 0′ to	1
Limestone, hard, with Spirorbis fossils, Johnstown	4
Fire clay to grade, Hardman	4

A sample was collected from the limestone at this point, the analysis of which is reported by Hite and Krak as follows:

	Per cent.
Silica (SiO_2)	3.13
Alumina (Al_2O_3)	2.82
Calcium Carbonate ($CaCO_3$)	90.75
Magnesium Carbonate ($MgCO_3$)	1.79
Phosphoric Acid (P_2O_5)	0.12
Loss on ignition	1.72
Total	100.33

Between the point last mentioned and Meriden Station the limestone was reported to have once been quarried for agricultural lime, but the place was abandoned and fallen shut. The limestone has a firm hard appearance in this cut and could probably be used to good advantage.

In Upshur, boulders of the limestone are visible along the railroad cut, one-half mile southeast of Hampton, evidently having been bedded in the shale just below the Lower Freeport Sandstone cliff. In the Sago Section, on page 134, the limestone is recorded 0′ 6″ thick.

In Washington District the limestone appears at a few points along the Coal and Coke Railway. The following exposure was noted 0.5 mile east of Tallmansville:

	Feet.
Shale, sandy, dark	10
Sandstone, shaly	3
Shale, dark	4
Sandstone, shaly	2
Slate, dark, Upper Kittanning Coal horizon (1735′ B.)	1
Limestone, shaly, Johnstown	2
Fire clay shale, Hardman, to grade	5

Another exposure 0.7 mile east of Tallmansville shows 2 feet of shaly limestone coming directly under 1 foot of slaty coal that represents the Upper Kittanning, the elevation of the latter formation being 1770′ L.

HARDMAN FIRE CLAY.

The Hardman Fire Clay of Hennen[2], belonging just under the Johnstown Cement Limestone, is not generally found in the counties under discussion, though its presence is noted in several sections published above under the description of the Limestone. At these exposures it is plastic and impure, and probably of no value for refractory purposes.

EAST LYNN SANDSTONE.

Along the Buckhannon River in Meade District, Upshur, two great sandstone cliffs extend up and down the river for several miles, their outcrops being almost continuous. The lower cliff is the Homewood Sandstone of the Pottsville, coming a short distance below the Lower Kittanning Coal which has been frequently mined in that locality. The upper cliff is only a few feet below the Upper Kittanning Coal and its base is about 65 feet above the top of the Homewood, being separated from the latter formation by croppings of sandy shales, sandstone and the Lower Kittanning Coal. At the village of Imperial this great upper cliff has been made the basis of an important glass-sand industry by the Imperial Sand Company, the plant of which will be described in Chapter XIII under the subject of "Glass-Sand"; hence, because of the confusion of terms mentioned under the description of the Lower Freeport Sandstone, page 250, it seems best to retain a distinct name for this stratum, and it will therefore be classified in this report as the **East Lynn Sandstone** of Krebs[3].

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[2] Ray V. Hennen, Monongalia-Marion-Taylor Report, W. Va. Geol. Survey, p. 347; 1913.

The typical position and character of the East Lynn Sandstone is well exhibited in the section for Imperial, published on page 136, where it is 45 feet thick, massive, gray and medium-hard, having a high percentage of silica, and coming only 3 feet below the blossom of the Upper Kittanning Coal from which it is separated by the Upper Kittanning Fire Clay.

In Pleasant District, Barbour, the East Lynn Sandstone appears in the shaft record of the Midland Coal & Coke Company, one-half mile north of Berryburg Junction, where as shown by the section for that place, page 83, it is a white stratum, 40 feet thick, and coming just below the Upper Kittanning Coal.

In Philippi District the ledge appears at numerous points east of the Tygart Valley River. It is reported by Teets 2.1 miles northwest of Calhoun, being 30 feet thick and having an elevation of 1750′ B., and also along the ridge 2.8 miles east of Lillian, where it is 20 to 25 feet thick.

In Cove District it is noted in the section for Moatsville, page 106, being 18 feet thick, and in that for Nestorville, page 104, being 43′ 11″, as determined by the boring that composes the lower part of the section.

In Glade District is was noted along the public road on a branch of Glady Creek, 0.9 mile southwest of Tacy, being a massive deposit with its top at an elevation of 1580′ B.

In Barker District it is noted in the section for Junior, page 115, being 14′ 9″ thick, as determined in a coal boring.

In Upshur it appears first along the Buckhannon River at the residence of W. L. Burner, at the north end of the village of Sago, Meade District, where its top is about 25 feet above the river at an elevation of 1440′ B. On Laurel Fork of French Creek it was noted in the hill road 1.3 miles northward from Evergreen, having its top at an elevation of 1650′ B. Along Indian Camp Run it forms a cliff at numerous points, being prominent at the Indian Camp School. In the section for Evergreen, page 133, it is recorded as being 45 feet thick. On Saw Mill Run, one-half mile west of Ours Mill, this sandstone comes at an elevation of 1545′ B., and forms the famous **"Split Rock"**, being a great massive ledge, 45 feet thick, a portion of which has split from the main cliff and is separated from it by an interval of about 5 feet at the top and 3 feet at the bottom, and making a picturesque scenic effect that has long been recognized as one of the most interesting in the county.

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[3] C. E. Krebs, Cabell-Wayne-Lincoln Report, W. Va. Geol. Survey, p. 183; 1913.

In Washington District, the East Lynn Sandstone makes a prominent feature along many of the Coal & Coke Railway cuts. The following section, measured with hand-level at the tunnel one-half mile east of Goodwin and arranged in descending order, illustrates well the relationship of the East Lynn Sandstone to the other members of the series:

Goodwin Section, Washington District, Upshur.

	Thickness. Feet.	Total. Feet
Sandstone, massive, Lower Freeport	10	10
Slate, dark, Upper Kittanning Coal horizon (1835′ L.)	2	12
Fire clay, gray, Upper Kittanning	5	17
Sandstone, massive, East Lynn	48	65
Concealed, should contain Middle Kittanning Coal	20	85
Sandstone, massive, may be base of East Lynn	10.	95
Coal, Lower Kittanning (3′ 6″) (1754′ L.) (Exposure No. 697 on Map IV)	3½	98½

At the **Coal & Coke Railway Quarry**, located 0.8 mile west of Sand Run Station, and on the south side of the railroad, the East Lynn Sandstone is quarried and crushed for concrete aggregate, according to Lloyd Wamsley, Superintendent, being used for the lining of the Pembroke Tunnel at the time the quarry was examined by Teets and the writer in 1915. About 30 feet of the upper portion of the ledge is visible, the elevation of its top being 1945′ B., and the quarry being 100 feet long and extending into the hill 50 feet. The stone here is massive and gray with a tinge of red, with numerous joint- and bedding-planes.

At the **John Nay Quarry,** located on the north side of the railroad at the west portal of the Sand Run Tunnel, this sandstone is 48 feet thick, as exhibited in the section for Sand Run, page 140, being 7 feet above the Middle Kittanning Coal. The stone here is gray, micaceous and massive, only 25 feet of the upper portion being used. The quarry is 100 feet long and extends into the hill 50 feet, many joint- and bedding-planes being visible. According to information given by John Nay, Superintendent, the stone was being used for tunnel lining along the railroad.

The stone is reported by Teets on Trubie Run, 1.7 miles southeast of Hampton, making a massive cliff, 25 feet thick, at an elevation of 1480′ B., and 1.3 miles northwest of Kedron, where it comes 15 feet above the Middle Kittanning Coal; and also on the head of a branch of Panther Fork, 1.8 miles east of Beans Mill, being 25 feet thick and pebbly, at an elevation of 2360′ B. In the section for Queen, page 142, it is noted 25 feet thick and pebbly.

In Banks District it is recorded in the section for Canaan page 151, being 32 feet thick, and in that for Cleveland, page 153, it is 30 feet thick.

This ledge was observed at several points in Roaring Creek District, Randolph County. On the ridge one-half mile north of Pumpkintown, it is a massive, pebbly formation, having an elevation of 2470′ B. On the head of Big Laurel Creek, 1 mile northeast of Pumpkintown, it makes a cliff, 30 feet thick, its elevation being 2365′ B. One mile east of Kingsville it is 30 feet thick and pebbly, the elevation of its top being 2250′ B. One-half mile northeast of Coalton it makes a cliff 20 feet thick, the elevation of its top being 2270′ B. In the region west of Roaring Creek Junction it makes numerous exposures. On the head of Kettle Run, 1.2 miles southwest of Pumpkintown, it is a massive cliff, 25 feet thick, at an elevation of 2265′ B.

The generally massive and durable quality of the East

Lynn Sandstone insures an abundance of good stone for masonry wherever it outcrops.

In Pleasant District, Barbour, this sandstone is reported by Teets along the west side of the Tygart Valley River, opposite Felton Station, 13 feet of it being visible above the river, the elevation of its top being 1320′ B. In Union District it was noted by Teets at the mouth of Island Run, 1 mile southwest of Hall, being a massive deposit with an elevation of 1410′ B.

In Philippi District it appears in the section for Tygart Junction, page 99, being 40 feet thick and making a massive cliff rock in the hill just northeast of the railroad station, being the second cliff above the railroad. It is also reported by Teets near Lillian and near Mt. Liberty, having much the same character as at Tygart Junction. In the section for Philippi, page 97, it is recorded in the boring as being 15′ thick.

In Barker District it is recorded in the section for Belington, page 112, as being 45 feet thick, and in Valley District it is noted in that for Skidmore, page 115, as being 50 feet thick and pebbly.

In Upshur it is reported by Teets in Union District at the road fork 1 mile northeast of Vegan, making a massive cliff, 25 feet thick, at an elevation of 1981′ L.; and also on Hooppole Run, three-fourths mile northwest of Yokum, where it is 25 feet thick and massive, and in the section for Lantz, page 132, it is 31 feet thick and massive.

On the west side of the Buckhannon River, just north of Sago Station, Meade District, the East Lynn Sandstone has been used from the **George Burner Heirs Quarry,** for bridge piers and abutments, according to Teets, being gray and medium-coarse. The quarry is 75 feet long and reaches into the hill 15 feet, 12 feet of the lower part of the ledge being used. Here the sandstone directly overlies an old digging in the Lower Kittanning Coal, the elevation being 1450′ B.

In the section for Beans Mill it is recorded as 30 feet thick and massive.

In Washington District this ledge was noted by Teets at numerous points. Just east of Goodwin it is 15 feet thick and directly overlies the Lower Kittanning Coal. On Grassy

Run, one-half mile southeast of Tallmansville, it has been quarried for chimneys and cellars built in the neighborhood, some of which have stood for 30 years without appreciable disintegration. Here the stone is massive, medium-coarse, and comes 15 feet above an opening in the Lower Kittanning Coal, and having an elevation of 1685′ B. Three-fourths mile north of Queen, it is 15 feet thick, coming over the Lower Kittanning Coal. On Leonard Fork of Middle Fork River, 1.3 miles southwest of Queen, it is 25 feet thick and massive, with an elevation of 2400′ B. In the section for Kedron, page 142, it is recorded 20 feet thick. About one mile southeast of Beans Mill it makes a pebbly cliff, 30 feet thick, at an elevation of 2210′ B.

In Banks District it is noted in the section for Canaan, page 151, being 25 feet thick; in that for Cleveland, page 153, it is 35 feet; in that for Honey Camp, page 154, it is 15 feet; and in that for Cow Run, page 149, it is 55 feet.

In Roaring Creek District, Randolph, it is noted in the section for Pumpkintown, page 167, being 45 feet thick.

MIDDLE KITTANNING COAL.

The Middle Kittanning Coal, of the Pennsylvania geologists, is an irregular deposit occurring from 0 to 50 feet above the Lower Kittanning, being sometimes combined with the latter seam so that both are mined in the same opening with only a barely perceptible parting between them, and at other times separating from the parent seam far enough to make it a separate bed over wide areas. In the regions of its best and most typical development, it comes just below the East Lynn Sandstone and is occasionally separated from the Lower Kittanning by the sandstone, but when the interval between the two coals diminishes to a few feet or less, the sandstone disappears entirely from the measures. Owing to this irregular interval, the Middle Kittanning can scarcely be described or cropped as a separate bed, but its thickness, distribution and character, together with detailed bed sections will be given in conjunction with the discussion of the Lower Kittanning Coal in Chapter XI, under the subject of "Coal".

LOWER KITTANNING COAL.

The Lower Kittanning Coal, named by J. P. Lesley from its occurrence in Armstrong County, Pa., has a greater areal extent than any other coal seam found in the three counties, and is usually of minable thickness wherever it crops as well as in many localities where it is under drainage and has been tested by the core drill. Its position in the measures is from 170 to 190 feet below the Upper Freeport, and from 15 to 50 feet above the top of the Homewood Sandstone. It is a double-bedded seam usually having from 4 to 8 inches of slate or bony coal about one-third way up from the bottom and often a minor parting above this. Its outcrop is shown on Maps II and IV, and the red structure contours show its height above sea-level. Its thickness, chemical character and distribution, together with detailed bed sections, will be fully discussed in Chapter XI, under the subject of "Coal".

LOWER KITTANNING FIRE CLAY.

The Lower Kittanning Fire Clay, coming just under the Lower Kittanning Coal, has a wide distribution in western Pennsylvania, Ohio, and is also mined extensively in Hancock County, West Virginia, but in the counties under discussion it is not prominent, having been noted at only a few points in southern Upshur, where it is sometimes flinty.

In Union District it was noted by Teets on Whiteoak Run, 0.9 mile west of Midvale, being 5 to 6 feet thick and flinty, where it occurs in the county road at an elevation of 2040′ B.

In Washington District it was observed by Teets 0.5 mile west of Queen, being 4 feet thick and flinty, at an elevation of 2240′ B.; and also on the head of Leonard Run, 2 miles southeast of Beans Mill, where the following section was secured:

	Ft.	In.
Sandstone, massive, coarse, East Lynn..........	25	0
Coal blossom, Lower Kittanning (2340′ B.)......	0	6
Firt clay, flinty, Lower Kittanning.............	5	0

CLARION SANDSTONE.

The Clarion Sandstone of the Pennsylvania geologists, coming below the Lower Kittanning Fire Clay, is not usually found in the area under discussion, as the Lower Kittanning Coal is often separated by only a few feet of shales from the Homewood Sandstone. When present at all, the Clarion Sandstone is of the same general type as the others of the Allegheny Series, being massive and gray in color.

In Barbour it is noted in the section for Colebank, page 101, being 36 feet thick; and in the section for Belington, page 112, being 15′ 6″ thick, and it is generally present along the Tygart Valley River between Philippi and Belington. In Upshur it is noted in the section for Sand Run, page 140, being 10 feet thick and shaly; in those for Lantz and Overhill, the thickness not being determined in either; and in that for Frenchton, page 147, where it is 20 feet thick, as recorded in an oil well.

CLARION COAL.

The Clarion Coal, named by the Pennsylvania geologists from its occurrence in that State, and like the Clarion Sandstone above it, not of general occurrence in the counties of this report, owing to the usual absence of this group from the lower part of the Allegheny Series, has been found at a few points along the Tygart Valley River between Philippi and Elkins, where it is mined at a few openings. It is too thin and uncertain to be classed generally as a minable bed, but such openings as were found will be described in Chapter XI, under the subject of "Coal".

CHAPTER VIII

STRATIGRAPHY—THE POTTSVILLE SERIES.

The Pottsville Series was first named and described by Pennsylvania geologists from its occurrence at Pottsville, eastern Pennsylvania, where it has numerous beds of conglomeratic sandstone, separated by anthracite coal seams. Later it was subdivided by I. C. White into the Upper Pottsville, or Kanawha Group, the Middle Pottsville or New River Group, and the Lower Pottsville or Pocahontas Group. The series is represented in the territory of this Report by only the two upper divisions, (the Pocahontas type of coal not being found so far north), and their rocks cover a large portion of southern Upshur and western Randolph, as well as appearing in several regions in Barbour, as fully outlined on Maps II and IV.

THE KANAWHA GROUP.

GENERAL DESCRIPTION AND SECTION.

The Kanawha Group of White[1], composing the upper portion of the Pottsville Series, consists mainly of massive, gray sandstone beds, varying from 10 to 75 feet in thickness, separated by deposits of sandy or carbonaceous shale, with coal seams usually appearing somewhere between the successive ledges of rock. Nearly all of these coal seams are somewhat lenticular, being apparently in good development in some localities, while they are but poorly represented in neighboring areas, indicating a marked irregularity of old shore-lines in the Paleozoic Sea. As defined in this volume, the group varies in thickness from about 350 feet in northern Upshur and western Barbour to 650 feet in western Randolph in the Pickens region. Many new coals and sandstones appear in the measures to account for the expansion in thickness, and these coals probably nearly all represent beds that extend southwestward across the State to the Virginia and Kentucky Lines, where the Kanawha Group has a thickness of 2100 feet, and where many more beds of coal are found than occur in western Randolph. Inasmuch as detailed studies are not yet complete on the counties of Webster, Nicholas, and Fayette, lying between Randolph and the southern counties, there is still some doubt as to the correlation of the less persistent seams of Randolph, although the main beds are fairly well established. Many of the coals are only thin seams of the same general type with no characteristic parting slates or other physical features by which to distinguish them readily, and most of the fossiliferous limestones that occur in the southern counties are not found so far north.

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[1] I. C. White, Vol. II, W. Va. Geol. Survey, pp. 500-502; 1903.

In naming these coals of Randolph, therefore, it has seemed best to apply the names used in western Pennsylvania, as far down in the rock column as they can be definitely identified, both because of their priority of usage and on account of the greater certainty of their correct correlation. The coals which apparently are not represented in the Pennsylvania and northern West Virginia column will be correlated as closely as possible with the southern West Virginia names.

The following general section is compiled to show the entire rock succession of the Pottsville, as observed in western Randolph:

General Section of the Pottsville Series for Barbour, Upshur, and the Western Portion of Randolph Counties.

	Thickness. Feet.	Total Feet.	
Kanawha Group (645')			
Sandstone, Homewood, massive, gray, often pebbly, prominent along the Tygart Valley River, on Roaring Creek, and along the headwaters of the Little Kanawha	25 to 60	60	
Coal, Upper Mercer, lenticular, often splinty	0 to 10	70	70'
Shale, sandy, and dark, with lenticular sandstones	25 to 60	130	
Kanawha Black Flint (Mercer Limestone of Pa.?), dark slate with occasional marine fossils	0 to 5	135	

	Thickness. Feet.	Total. Feet.	
Coal, Lower Mercer (Stockton of Kanawha Valley), hard and splinty, mined at Craddock, Canaan and other points in southern Upshur	0 to 5	140	70′
Sandstone, Upper Connoquenessing (Upper Coalburg) of Kanawha Valley?), massive, grayish-white, with quartz pebbles, prominent along Tygart Valley and Middle Fork Rivers....................	30 to 65	205	
Coal, Quakertown "Rider" (not previously described), noted at Laurel Station on Tygart Valley River...	0 to 1	206	66′
Shale, sandy.........................	0 to 7	213	
Slate, Quakertown (not previously described, hard, black, fissile and carbonaceous, often having Lingulae and Naiadites fossils, most conspicuous at Laurel Station on Tygart Valley River.............	0 to 4	217	
Coal, Quakertown (Coalburg? or Winifrede? of Kanawha Valley), medium-hard	0 to 3	220	14′
Shale, gray, sandy....................	0 to 10	230	
Sandstone, Lower Connoquenessing (Lower Winifrede? of Kanawha region), massive, gray...........	30 to 60	290	
Shale, sandy.........................	0 to 8	298	
Coal, Chilton.........................	0 to 2	300	80′
Shale, sandy.........................	0 to 10	310	
Sandstone, Upper Cedar Grove, massive, gray........................	0 to 28	338	
Coal, Cedar Grove....................	0 to 2	340	40′
Shale, sandy.........................	5 to 10	350	
Sandstone, Lower Cedar Grove, gray and massive....................	10 to 48	398	
Coal, Alma, medium-hard, mined near Pickens	0 to 2	400	60′
Shale, sandy.........................	0 to 5	405	
Sandstone, Monitor, gray, massive...	0 to 22	427	
Coal, Campbell Creek (No. 2 Gas), mined extensively for local use in Pickens region, medium-hard, usually single-bedded..............	1 to 3	430	30′
Shale, sandy.........................	10 to 20	450	
Sandstone, Brownstown, massive, gray	10 to 47	497	
Coal, Powellton, medium-hard, single-bedded	1 to 3	500	70′
Shale, sandy.........................	0 to 10	510	
Sandstone, Eagle, gray, massive.......	20 to 46	556	
Limestone and Shale, Newlon, (not previously described, black fissile shale with limestone "turtleback" concretions	0 to 20	576	

	Thickness. Feet.	Total. Feet.	
Coal, Eagle, medium-hard, with bony streaks, known as the "Gimmel" Seam north of Pickens...........	1 to 4	580	80′
Sandstone, Decota, gray, massive.....	10 to 20	600	
Shale, dark, **Eagle,** carries marine fossils in southwestern counties; none found in Randolph..........	2 to 10	610	
Sandstone, Upper Gilbert, gray, massive	20 to 33	643	
Coal, Gilbert, medium-soft, opened near Adolph on Middle Fork River....	1 to 2	645	65′
New River Group (405′)			
Sandstone, Upper Nuttall, gray, massive	10 to 20	665	
Shale, sandy.......................	5 to 10	675	
Sandstone, Lower Nuttall, coarse, gray and massive, usually making cliff........................	20 to 37	712	
Coal, Hughes Ferry, soft, columnar, single-bedded, upper prospect at Hartridge	1 to 3	715	70′
Shale, sandy.......................	5 to 10	725	
Sandstone, Middle Iaeger, gray, massive	15 to 23	748	
Coal, Lower Iaeger, soft.............	1 to 2	750	35′
Shale, sandy.......................	5 to 10	760	
Sandstone, Harvey, coarse, gray, massive	20 to 37	797	
Coal Castle, soft, columnar, prospected near Cassity, on Middle Fork River	1 to 3	800	50′
Shale, sandy.......................	0 to 10	810	
Sandstone, Guyandot, gray, massive..	25 to 48	858	
Coal, Sewell "B", soft...............	0 to 2	860	60′
Shaile, sandy.......................	0 to 10	870	
Sandstone, Lower Guyandot, gray, massive	10 to 20	890	
Shale, Hartridge, (not previously described), black, fissile, and carbonaceous, with shells of marine and non-marine origin, **Naiadites, Lingulae,** etc..................	2 to 5	895	
Coal, Sewell (Sharon? of Pennsylvania), soft, columnar, mined at Cassity, Hartridge, and on Mill Creek and Rich Mountain........	2 to 5	900	40
Shale, sandy.......................	5 to 10	910	
Sandstone, Welch, gray, massive.....	10 to 27	937	
Coal, Welch, soft, columnar..........	1 to 3	940	40′
Shale, sandy.......................	10 to 35	975	
Sandstone, Sharon (Upper Raleigh, of Raleigh County), great massive pebbly conglomerate of Rich Mountain region.................	25 to 75	1050	
Mauch Chunk Red Shales..................			

DESCRIPTION OF MEMBERS, KANAWHA GROUP.

HOMEWOOD SANDSTONE.

The Homewood Sandstone, named by I. C. White from its outcrop in Beaver County, Pennsylvania, and coming at the top of the Pottsville, is usually found in massive development wherever its horizon occurs above drainage in all three counties. It is usually grayish-white, hard and coarse, often carrying quartz pebbles, and varying in thickness from 25 to 75 feet. In Barbour it crops above drainage along the Tygart Valley River all the way from the Taylor County Line to Arden, and, along with the Upper Connoquenessing below it, gives the valley its strikingly rugged appearance. From Arden to Tygart Junction, it is mostly below drainage, but near the latter place it rises above the level of the river and remains above it across the Hiram Anticline and finally goes below water-level again in the vicinity of Lehigh. Between Lehigh and Junior it is below drainage, but at the latter place it emerges again and stays above all the way to the Randolph Line.

At the **Gage Coal & Coke Company Quarry,** located just north of Gage on the east side of the Tygart Valley, the Homewood has been used extensively for coke-oven material and for other structures around the mines. The stone here is hard and gray, massive and coarse, with a few quartz pebbles, and is very much broken up by joint-planes and streaks of shale that cut through it in irregular directions. The quarry is 300 feet long and extends into the hill 100 feet. About 30 feet of the upper portion of the ledge has been worked, the elevation of its top being 1785′ B.

In eastern Barbour the Homewood appears above drainage along the foot of the Laurel Ridge, where the rapidly rising structure east of the Belington Syncline brings it up, and the same rise of the rocks soon carries its horizon far above the slope of the mountain.

In Upshur the Homewood is above drainage in all the southern end of the county, including portions of Union, Meade, Washington, and Banks Districts. Along the Buckhannon River, it appears above water-level just south of Sago, and makes a prominent cliff all the way to Alexander, beyond which it is so high in the hills that it is not prominent. At the famous "Hanging Rock", 0.7 mile southeast of Ours Mill, the ledge is 50 feet thick, coming 23 feet above the level of the railroad grade, and making an immense overhanging cliff, under which the trains must pass. At Craddock the stone was once quarried extensively for glass-sand by the Silica Sand Company, a description of whose plant will be given in Chapter XIII, under the subject "Glass-Sand". Along the various branches of the Little Kanawha River this ledge is very prominent, making almost unbroken lines of cliff on either side of the valleys for many miles, and usually having a great abundance of quartz pebbles.

In Randolph, the Homewood, in conjunction with the Upper Connoquenessing just below it, makes a double line of cliffs on each side of the Tygart Valley, nearly all the way from the Barbour Line to Roaring Creek Junction, east of which it rises rapidly and disappears above the tops of Laurel Ridge and Rich Mountain. Along Roaring Creek these two ledges form great pebbly cliffs all the way from the mouth of the stream to Coalton, giving the creek its name on account of its rough descent over the boulders and ledges. The Homewood has often been termed the **"Roaring Creek" Sandstone,** from its occurrence in this region.

At the **Workman Brothers' Quarry,** located along the Western Maryland Railway, on the east side of the Tygart Valley River, at the Kaufman Church, one mile northeast of Laurel, the Homewood has been quarried extensively, mostly for railroad ballast. The quarry is 200 feet long and extends into the hill 100 feet, the cliff being 50 feet thick, with an elevation at its top of 1883′ B. Stone from this quarry was used for the abutments and piers of the Coal and Coke Railway bridge across the Tygart Valley River, where it cuts through the gorge between Rich Mountain and Laurel Ridge, and also for the palatial residence of the late Henry G. Davis, of Elkins.

At the **Coal & Coke Railway Quarry,** located on the south side of the line, 0.9 mile northwest of Leiter, the stone has been quarried extensively, and crushed for railroad ballast, 35 feet of the ledge being exposed, with its top at an elevation of 1975′ B. The quarry is 100 feet long and extends into the hill 100 feet, the stone being gray and massive, with numerous joint- and bedding-planes.

Along the Middle Fork River, the Homewood is a prominent cliff in the hilltops in the vicinity of Gale, and farther south it may be found, but it is not nearly so prominent as the great Upper Connoquenessing below it.

Along the Right Fork of the Buckhannon River, the Homewood makes a cliff in the tops of the hills and at Silica, it was formerly quarried for glass-sand by the Enterprise Silica Sand Company, the plant of which will be described in Chapter XIII, under the subject of "Glass-Sand". South of Pickens it appears for the last time in the high tops of Turkeybone Mountain, where it is responsible for the presence of these picturesque monadnocks.

UPPER MERCER COAL.

The Upper Mercer Coal, of the Second Geological Survey of Pennsylvania, coming just under the Homewood Sandstone, is found at various localities in all three counties of the present Report, although it is lenticular and frequently thins out completely in only a short distance. In these counties, as well as in southern Lewis, farther west, its position is 40 to 75 feet above a horizon containing the Kanawha Black Flint fossils, giving rise to the possibility that it may be found to correlate with the No. 5 Block of Fayette County, but this is a matter that future investigation must determine. The outcrop of the Upper Mercer Coal, in those regions where it is known or believed to be of possible minable thickness, is shown on Maps II and IV, and in Chapter XI its areal extent, character, and thickness, together with numerous detailed bed-sections, will be discussed in full.

KANAWHA BLACK FLINT.

The Kanawha Black Flint, of Rogers[2], was named from its occurrence in the Great Kanawha Valley, where it is a hard black, flinty horizon, carrying marine fossils. This formation was recognized and identified from its fossils at Hemlock in southern Upshur, where, according to the Hemlock Section, page 146, it comes 174 feet below the top of the Homewood Sandstone, an interval which differs by only a few feet from that found between the same formations at Bablin, Lewis County, and that, according to Hennen, is preserved with little variation across Braxton and Clay to the Kanawha Line. The exposure at Hemlock is in the public road, 0.7 mile southwest of the village, at an elevnation of 2605′ B., the fossils being found in 6 inches of shale, coming over a thin coal seam. **Spirifer** and **Derbya** being among the most conspicuous forms recognized. Dr. Wm. Armstrong Price has declared the fossils found here to be similar to those found elsewhere in the Black Flint, confirming the writer's identification on stratigraphic evidence.

In eastern Barbour **Derbya robusta**, classified by Dr. Price as a common type of the Kanawha Black Flint, was found along a road on the western slope of the Laurel Ridge, 0.7 mile northwest of Thorn Knob and 5 miles northeast of Belington, at an elevation of 2320′ B. Unfortunately the dip of the measures in this locality is so great that no connected section could be made with the rocks above or below the fossil horizon.

An extensive search was made at the Black Flint horizon in all three counties but fossils were not found elsewhere, leading to the conclusion that salt water probably covered only a small portion of this region when the Flint fauna flourished in the Kanawha Valley.

The position of the Kanawha Black Flint in the stratigraphic column of the Pottsville of western Pennsylvania and northern West Virginia has long been a subject of speculation and controversy among geologists, the conclusion of I. C. White and David White being that it belonged somewhere in the Mercer Group, which comes between the Homewood and

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[2] W. B. Rogers, Fifth Annual Report of Virginia; 1839.

Connoquenessing Sandstones[8]. The studies of the writer in Webster County, in 1916, have revealed the Black Flint with its characteristic fossils coming just over the Lower Mercer Coal that is mined extensively in southern Upshur and northern Webster. Since the stratigraphic position of this coal is at or near the top of the Upper Connoquenessing Sandstone, which has been traced all the way from the Pennsylvania Line to southern Upshur, the earlier deduction of the Whites seems to be entirely confirmed.

LOWER MERCER (STOCKTON) COAL.

The Lower Mercer Coal, of the Pennsylvania geologists, coming from 30 to 70 feet below the Upper Mercer, and about 140 feet below the top of the Homewood Sandstone and directly below the fossiliferous Kanawha Black Flint, has been mined extensively for local domestic use in Banks District. Upshur, where it is a hard, semi-splint coal of good quality, being usually single-bedded. Its extent, chemical character, and detailed bed-sections will be presented in Chapter XI, under the subject of "Coal", and on Map IV, its outcrop is shown where it is known or believed to be of minable thickness.

UPPER CONNOQUENESSING SANDSTONE.

The **Upper Connoquenessing Sandstone,** first named and described by I. C. White, from its occurrence in Lawrence County, Pennsylvania, and having its base from 150 to 200 feet below the top of the Homewood, is one of the most conspicuous sandstone members of the entire Pottsville. It is usually from 50 to 75 feet thick, hard and durable, making great cliffs, grayish-white in color, and usually carrying an abundance of quartz pebbles, varying from one-fourth to three-fourths inch in diameter and having an angular appearance with the corners slightly rounded by friction.

In Barbour the Upper Connoquenessing is above drainage and prominent along the Tygart Valley River on either side of the Hiram Anticline. At the falls of the river 1.5 miles southwest of Moatsville, it is about 50 feet thick, and pebbly, the falls occurring over the middle 25 feet of the ledge. The cliff appears above the same river three-fourths mile southeast of Tygart Junction, and remains above drainage for several miles where the Hiram Anticline has raised the strata to a high level in this region. One mile northwest of Wilmoth Ford, it descends below the river level on the dip toward the Belington Syncline, making a succession of low falls, totalling about 40 feet in height. In the eastern part of the county it crops along the foot of the Laurel Ridge and is soon carried above the mountain tops by the eastward rise of the rocks.

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[8] I. C. White, Vol. II(A), W. Va. Geol. Survey, pp. 487-488, 1908.

In Upshur County the horizon of the Upper Connoquenessing is above drainage in portions of Union, Meade, Washington, and Banks Districts, but is usually not so conspicuous as the Homewood above it. It is best developed in the southeastern corner of the county east of Queen, Hemlock, and Palace Valley, where it makes a prominent ledge high in the hilltops, being usually pebbly and massive. In Banks District, it makes the falls in the Little Kanawha River at Arlington, where it is a massive pebbly ledge.

In Randolph County, the Upper Connoquenessing is the most prominent ledge along the Middle Fork River, being a noticeable feature all the way from Ellamore to the Big Laurel Thicket, where it caps the moutain. In the vicinity of Cassity, the southward rise of the rocks has elevated it nearly to the top of the hills, and southward it remains at the same high level, just topping the ridges with a great, bold, pebbly ledge, the debris and pebbles from which litter the valley below. West of West Huttonsville, the rise of the rocks toward the Hiram Anticline keeps the ledge near the top of the hills all the way to Blue Rock, where it makes a prominent cliff 50 feet thick, at an elevation of 3300′ B., just east of the divide between Middle Fork and Buckhannon Rivers. Northward from Blue Rock it caps the ridge of the mountains, being prominent at See Camp Gap, and descending northward with the dip of the measures along the axis of the anticline, all the way to the Middle Fork River.

Along the Tygart Valley River the ledge rises above drainage near the Barbour Line, and together with the Homewood above it, makes great cliffs along both sides of the river

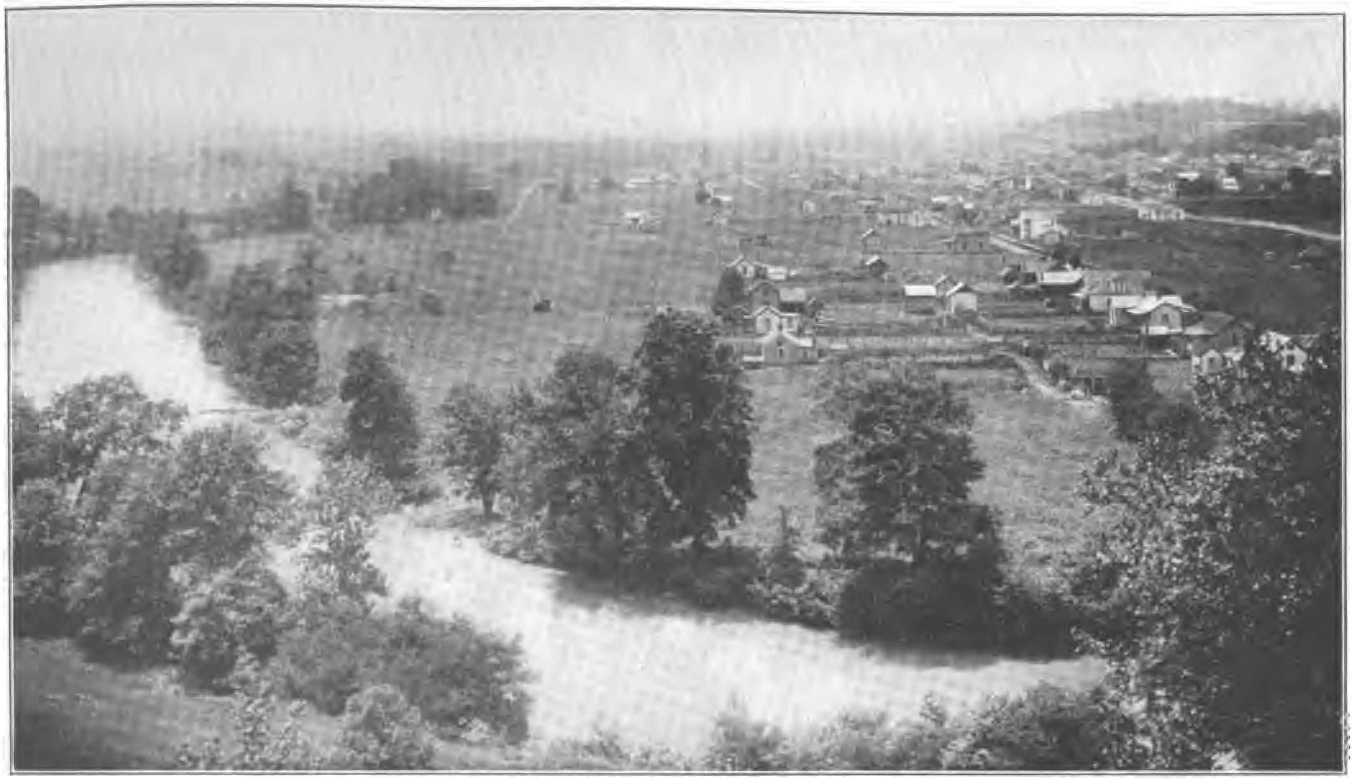

PLATE XVI.—View of South Buckhannon, looking south and showing broad flood-plain of the Buckhannon River; Topography of the Conemaugh Series.

all the way to Roaring Creek Junction, where the dip of the measures toward the Belington Syncline has partly submerged it, but the southeastward rise soon brings it above the river and it is conspicuous along the mountain side, rising to the top of Laurel Ridge and Rich Mountain at the river gap. Along Roaring Creek it again forms twin cliffs with the Homewood, as previously described under the latter formation, being pebbly and massive.

So far as known, the Upper Connoquenessing has not been quarried in any of the counties, its pebbly character making it unsuitable for general building purposes, although it could be used for bridge abutments or rough masonry if so desired.

QUAKERTOWN "RIDER" COAL.

The section for Laurel, Roaring Creek District, Randolph County, published on page 162, shows a coal 4 inches thick, occurring just beneath the great Upper Connoquenessing Sandstone ledge, and 15 feet above the Quakertown Coal. So far as known, this coal has not been previously noted or described and it is therefore named the **Quakertown "Rider" Coal.** It does not attain minable thickness in the three counties and is usually absent entirely.

QUAKERTOWN BLACK SLATE.

In the section for Laurel, Roaring Creek District, Randolph, made along the Western Maryland Railway, on the east side of the Tygart Valley River, 0.3 mile south of Laurel Station, and published on page 162, a black, fossiliferous slate appears, coming 5 feet above the Quakertown Coal, and 8 feet below the Quakertown "Rider". It is hard, fissile, and carbonaceous, being highly resistant to erosion. The principal fossils observed were **Lingula kanawhensis** and **Naiadites elongata,** the latter type being especially numerous, the latter being of probable non-marine origin. So far as known this slate has not been previously noted or described and it will therefore be called the **Quakertown Black Slate,** from its relation to the coal of the same name. The same slate was noted by Hennen and the writer at Adma Station, Barbour, along the Tygart Valley River, coming just below the Upper Connoquenessing ledge, at an elevation of 1560' B., and having the same species of **Naiadites.** It was also noted at Clements, along the same river, and just under the sandstone ledge. It was noted again at the base of the Upper Connoquenessing on Bear Knob, three-fourths mile northwest of Cassity, on Middle Fork River, as shown by the section for that town, page 170, and has there the same species of **Naiadites,** which is seemingly its characteristic fossil. On the Buckhannon River, Meade District, Upshur, one-half mile north of Beans Mill, this black slate is apparently replaced by an impure fire clay shale, a chemical analysis of which is published in Chapter XIII under the subject of "Clays".

QUAKERTOWN (COALBURG? OR WINIFREDE?) COAL.

The Quakertown Coal, named by I. C. White from its occurrence at the village of that name on the Mahoning River, near the Ohio and Pennsylvania State Line, has been recognized generally throughout the three counties in the region of its crop, and in some sections it attains a thickness of three feet, having been mined for local fuel at numerous points. Its interval varies from 5 to 30 feet below the Upper Connoquenessing Sandstone, from which it is sometimes separated by the thin and lenticular Quakertown "Rider" Coal and the Quakertown Black Slate. The fact that it belongs 60 to 75 feet below the Kanawha Black Flint indicates that it must correlate either with the Coalburg or Winifrede Coal of the Kanawha Valley, the information recently acquired in field studies in Webster County favoring the latter horizon. The crop of the Quakertown Coal is shown on Maps II and IV in those regions where it is believed to be of value, and in Chapter XI its chemical character, areal distribution, and thickness, together with bed-sections, will be taken up in detail, under the subject of "Coal".

LOWER CONNOQUENESSING (LOWER WINIFREDE) SANDSTONE.

The Lower Connoquenessing Sandstone of I. C. White, separated from the Quakertown Coal by only a few feet of shale, was observed frequently in the regions where its horizon should crop, its most conspicuous development being along the Tygart Valley River in Barbour County, where the Hiram Anticline brings it above drainage in the neighborhood of Adma and Clements. It is usually a gray and massive sandstone, but is not generally conglomeratic, being in striking contrast to the Upper Connoquenessing above it.

CHILTON COAL.

The Chilton Coal of White[4], apparently belonging about 300 feet below the top of the Homewood Sandstone, is but poorly represented in the three counties. On the east side of Turkeybone Mountain, Middle Fork District, Randolph County, a coal has been opened, according to Teets, at the **Gottfried Busky Prospect, No. 906 on Map IV**, 1.8 miles southeast of Pickens, that is 275 to 300 feet below the horizon of the Lower Kittanning Coal and 125 feet above the Campbell Creek Coal, the tidal elevation of the prospect being 3450′ B. Information on the bed-section of the coal is lacking as the prospect had fallen shut, but its position indicates that it may be the Chilton Coal. Its apparently scant occurrence indicates that it can not be classed as a minable bed.

UPPER CEDAR GROVE SANDSTONE.

The Upper Cedar Grove Sandstone of Hennen and the writer[5] apparently belongs 5 to 10 feet below the Chilton Coal and just over the Cedar Grove, being gray and massive and 10 to 30 feet thick. The fact that all the sandstones of the Kanawha Group below the Upper Connoquenessing are of the same general type; namely, hard, gray, and massive, makes the positive identification of any single ledge a matter of much doubt, since some of them have thinned out and disappeared completely in the region between their type localities and the area of the present Report.

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[4] I. C. White, Vol. II(A), W. Va. Geol Survey, p. 430; 1908.
[5] Logan-Mingo Report, W. Va. Geol. Survey, pp. 169-170; 1914.

CEDAR GROVE COAL.

The Cedar Grove Coal of White[6], apparently belonging about 340 feet below the top of the Homewood Sandstone, was not certainly observed in the three counties, but a coal that seems to correspond to this horizon was noted across the line in Webster County, on the headwaters of Holly River, the description of which will be given in the Report for that county. It is possible that this coal could be found by prospecting in the region west of Pickens, but its thickness on the Holly River side (1′ 6″) indicates that it would not be of minable thickness in Randolph.

LOWER CEDAR GROVE SANDSTONE.

The Lower Cedar Grove Sandstone of Hennen and the writer[7], belonging apparently between the Cedar Grove and Alma Coals, appears to be represented by a gray, massive ledge in the Pickens region, although its correlation is open to question.

ALMA COAL.

The Alma Coal of White[8], named for its occurrence in the Kanawha Valley, where it has been mined extensively, is apparently represented in the counties of the present Report by a coal that comes about 400 feet below the top of the Homewood Sandstone. It appears to be too thin for commercial mining, but has been opened at a few points for local domestic use.

One-third mile southeast of Pickens, Middle Fork District, Randolph, a thin coal occurs that is 25 feet above the Campbell Creek Coal. It was once opened, according to Teets, at the **James Pickens Prospect, No. 907 on Map IV,** having an elevation of 2915′ B., but the prospect had fallen shut and could not be measured. This coal seems to represent the Alma horizon.

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[6] I. C. White, Bull. 65, U. S. G. Survey, pp. 138-140; 1891; and Vol. II(A), W. Va. Geol. Survey, p. 562; 1903.

[7] Logan-Mingo Report, W. Va. Geol. Survey, pp. 175-176; 1914.

[8] I. C. White, Vol. II(A), W. Va. Geol. Survey, pp. 404-407; 1908.

In Barbour, the same coal was noted in Valley District at **Exposure No. 908 on Map II,** in Valley District, along the east side of the Middle Fork River, 0.5 mile northeast of Lantz, being 0′ 4″ thick, at an elevation of 1900′ B.

In Upshur it was noted by Teets in Washington District, 1.8 miles southeast of Queen, its blossom showing in the public road at an elevation of 2255′ B.; and in the same District, 0.5 mile east of Hemlock, where its blossom is exposed in the highway at an elevation of 2630′ B.

In Randolph County, besides the exposure noted above, it has been prospected at several points near Adolph. **Prospect No. 909 on Map IV,** located 0.3 mile southwest of Adolph, had fallen shut, its elevation being 2540′ B. **Prospect No. 910 on Map IV,** located 0.4 mile southeast of Adolph, at an elevation of 2570′ B., was also abandoned. At the following the coal was partly exposed:

Fred Rush Prospect—No. 911 on Map IV.

On the Middle Fork River, 0.4 mile east of Adolph; **Alma Coal;** elevation, 2525′ B.

	Ft.	In.
Slate, black	3	0
Coal	0	11
Concealed by water, may have another streak of coal		

One mile southwest of Adolph, the blossom of a coal was observed at the root of a fallen tree, south of Birch Fork, at an elevation of 2790′ B., that represents this coal. At **Prospect No. 912 on May IV,** on Left Fork of Right Fork of Buckhannon River, just south of Czar, this coal was opened at an elevation of 2325′ B., but the place had fallen shut and could not be measured. The following opening was noted by Teets:

J. J. Wuerzer Farm Mine—No. 912A on Map IV.

On Trout Run, 1 mile southwest of Czar; **Alma Coal;** elevation 2570′ B.

			Ft.	In.
Slate				
Coal, soft	1′	6″		
Slate, gray	0	6		
Coal, soft	3	0	5	0
Slate, pavement				

MONITOR SANDSTONE.

The Monitor ("Logan") Sandstone of Hennen and the writer[9], belonging just over the Campbell Creek Coal, is apparently represented in Randolph by a massive, gray sandstone, 10 to 20 feet thick. It has no single feature to distinguish it from the other sandstones of the Kanawha Group, and so far as known has not been quarried in the three counties.

CAMPBELL CREEK ("NO. 2 GAS") COAL.

Over a considerable portion of Middle Fork District, Randolph, a coal has been mined extensively for local domestic use, coming at a maximum of 430 feet below the Lower Kittanning Coal, that has been frequently called the **Pickens Coal,** from its occurrence near the town of that name, on the Buckhannon River. It is the belief of I. C. White[10], that this coal represents the true Campbell Creek or "No. 2 Gas" of the Kanawha Valley, and the writer finds nothing to contradict this conclusion as its position by interval in the Kanawha Group would place it there, and all recent stratigraphic work apparently confirms this early correlation.

The following section, obtained by Teets, shows the usual occurrence of the Campbell Creek Coal in the Pickens region.

James Pickens Prospect—No. 962 on Map IV.

0.3 mile southeast of Pickens.

				Ft.	In.
Concealed					
Coal prospect, Alma Coal (2915' B.)					
Concealed and slate				22	0
Coal, soft	1'	7"			
Coal, bony	0	4	**Campbell Creek**		
Coal, harder	0	9	(2890' B.)	2	8
Slate and concealed				5	0
Coal, thickness concealed					

The Campbell Creek Coal as it occurs in Randolph County is usually characterized by a slate parting in the lower portion and often carries some layers of splinty coal, similar to that found in the Kanawha Valley. Its outcrop is shown on Map IV wherever its horizon outcrops in Randolph and Upshur, and in Chapter XI its chemical character, areal distribution, and thickness, together with detailed bed-sections will be discussed in full, under the subject of "Coal".

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[9] Logan-Mingo Report, W. Va. Geol. Survey, pp. 178-180; 1914; see also Wyoming-McDowell Report, p. 148; 1915.

[10] Vol. II, W. Va. Geol. Survey, p. 363; 1903; and Vol. II(A), p. 401; 1908.

BROWNSTOWN SANDSTONE.

The Brownstown Sandstone of White[11], belonging 10 to 20 feet below the Campbell Creek Coal, seems to be represented by a gray, massive ledge in the Pickens region, being 10 to 40 feet thick. So far as known it has not been quarried.

POWELLTON (BROWNSTOWN) COAL.

The Powellton (Brownstown) Coal of White[12] is apparently represented by a coal that has been prospected locally at a few points along the Middle Fork River, and on the waters of Buckhannon River between Newlon and Pickens.

In Valley District, Barbour, the coal was noted at **Exposure No. 977 on Map II,** on Middle Fork River, 0.5 mile northeast of Lantz, having a thickness of 1 foot, and an elevation of 1812′ L., and occurring just below a massive sandstone that crops only a few feet above the river at that point.

In Washington District, Upshur, a coal was reported in the bed of Middle Fork River at Gale at **Coal Exposure No. 978 on Map IV,** with a thickness of 1′ 6″, and an elevation of 1840′ B., and being 30 feet below the Campbell Creek Coal. The **E. T. Talbott Farm Mine (No. 979 on Map IV),** located on Laurel Run of Right Fork of Middle Fork, 1.7 miles southeast of Queen, apparently represents the Powellton horizon. This opening measured 1′ 9″ of clean coal, at an elevation of 2130′ B.

In Roaring Creek District, Randolph, the coal was once opened at the **William Tallman Prospect (No. 980 on Map IV),** located on Left Fork of Middle Fork, 1.1 miles southeast of

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[11] I. C. White, Vol. II, W. Va. Geol. Survey, p. 586; 1903.

[12] I. C. White, Vol. II, W. Va. Geol. Survey, pp. 511 and 585: 1903; and Vol. II(A), pp. 272 and 349; 1908.

Gale, having an elevation of 1940′ B., and a reported thickness of 1 foot.

In Middle Fork District, Randolph, the coal has been opened at the **Washington Bunner Farm Mine (No. 981 on Map IV)**, located on Bearcamp Run of Left Fork of Buckhannon River, 0.8 mile northeast of Czar, having an elevation of 2380′ B,. and a thickness of 1′ 3″, according to Teets. The **W. O. Smith Prospect (No. 982 on Map IV)**, located on Hooker Run of Middle Fork of Buckhannon, 1.6 miles south of Newlon, showed 1′ 1″ of coal, according to Teets, at an elevation of 2085′ B. It was also opened on the same run at **Coal Prospect No. 983 on Map IV**, located 2.2 miles south of Newlon, having an elevation of 2235′ B., the thickness of the coal not having been learned. At **Coal Exposure No. 984 on Map IV**, located on Right Fork of Buckhannon River, 0.3 mile west of Silica, a coal is visible in the railroad cut, having a thickness of 0′ 5″ and an elevation of 2350′ B., that apparently represents the Powellton. At **Coal Prospect No. 985 on Map IV**, located on the same fork of Buckhannon, 0.7 mile southeast of Silica, 1 foot of soft coal was found, having an elevation of 2460′ B:, and coming 20 to 30 feet above the Eagle Coal. It was opened again at **Coal Prospect No. 986 on Map IV**, located on the same fork of Buckhannon, 1.3 miles northwest of Pickens, having an elevation of 2570′ B., the thickness of the coal not being known.

These various openings and exposures noted above indicate only a thin bed of coal at the Powellton horizon, that must be classed as too thin for commercial mining.

EAGLE SANDSTONE.

The **Eagle Sandstone** of Hennen and the writer[18], belonging over the Eagle Coal, is apparently represented in the Pickens region by a massive, gray ledge, 20 to 40 feet thick. So far as known it has not been quarried.

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[18] Logan-Mingo Report, W. Va. Geol. Survey, p. 199; 1914.

NEWLON LIMESTONE AND SHALE.

Just east of the town of Newlon, Banks District, Upshur, a bed of limestone appears in the cut along the Chemical and Helvetia Railroad, that apparently corresponds to no known member of the Pottsville in the northern part of the State and it is therefore called the **Newlon Limestone and Shale** in this Report. Its appearance there, as observed by the writer, is as follows:

	Ft.	In.
Shale, dark, sandy, with numerous concretions and large siliceous limestone "turtlebacks", **Newlon Limestone and Shale**	25	0
Slate, dark, coaly, **Eagle Coal** (1915' B.)	0	6
Fire clay, siliceous, to grade	4	0

The Newlon Limestone in its typical appearance at this place bears a striking resemblance to the Eagle Limestone and Shale of the Kanawha Valley, which often segregates into turtle-shaped boulders scattered through the shale, as may be seen in the vicinity of Danville, Boone County, and at other points, and it may represent the same horizon although it comes above what seems to be the Eagle Coal. At Newlon its position in the Kanawha Group is 553 feet below the top of the Homewood Sandstone, as shown by the Section for Newlon, page 155, making it about the middle of the Group. A thorough search for fossils was made at Newlon and elsewhere, by both Teets and the writer, but none was found, either in the shale or in the limestone concretions, except at a point along the Right Fork of Buckhannon River, 0.7 mile southeast of Arvondale Junction, where small fossils pronounced by Dr. Price to be **Naiadites elongata**, a form that is found at various horizons in the Kanawha and New River Groups, were discovered. Hence the vital evidence necessary definitely to correlate it with the Eagle or anything else is still lacking, as it is a well-known fact that limestone concretions of this character are frequently found in shale beds that have a large enough percentage of lime to form them.

The Newlon Limestone does not preserve its typical character over a wide area. It was observed on Left Fork of Right Fork of Buckhannon River, 0.5 mile southwest of Czar, and also at the south edge of the village, where it is a black shale, 5 feet thick, at an elevation of 2170' B. It was also noted in the public road 0.8 mile southwest of Star on the Left Fork of Buckhannon, at an elevation of 2900' B., and at a few other points the outcroppings of the shale were observed.

EAGLE COAL.

The Eagle Coal of White[14] is apparently well represented in the Pickens region, being called locally the **"Gimmel Seam"** from the opening on the land of that name along the Buckhannon River north of Pickens. As shown by the section for Silica, page 181, it belongs 580 feet below the Lower Kittanning, an interval that differs but slightly from that found along Holly River, Webster County, where it has an average of about 550 feet below the Kittanning, and where the correlation seems open to little doubt. The character of the coal is much the same, there being a streak of bony coal at the top and a slate parting near the bottom. This coal is minable over a considerable area, sometimes having a thickness of four feet, and its extent, thickness, and chemical character will therefore be taken up in Chapter XI, under the subject of "Coal". Its crop is shown on Maps II and IV wherever it is thought to be of value.

DECOTA SANDSTONE.

The Decota Sandstone of Krebs[15], belonging a few feet under the Eagle Coal, seems to be present in the Pickens region as this place is occupied by a gray, massive sandstone of the usual Kanawha type, its presence being noted in various sections in Chapter IV. So far as known it has not been quarried.

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[14] I. C. White, Bull. 65, U. S. G. S., p. 140; 1891; and Vol. II, W. Va. Geol. Survey, p. 587; 1903.

[15] C. E. Krebs, Kanawha Co. Report, W. Va. Geol. Survey, p. 292; 1914.

EAGLE LIMESTONE AND SHALE.

The Eagle Limestone and Shale of White[16], coming about 75 feet below the Eagle Coal at its type locality in Fayette County, and having an abundant marine fauna in several of the southwestern counties, is apparently but poorly represented in Randolph. No fossils were found at its horizon but in Middle Fork District, Randolph, a black shale deposit, 15 feet thick, was found on the head of Back Fork of Elk, 0.8 mile southeast of the Parting Springs, that seems to represent it. The shale bed is exposed along the Alexander and Eastern Railroad cut but no fossil forms were certainly identified in it. The shale appears to belong 35 to 50 feet below the Eagle Coal and it is possible that an extended search might reveal the fossils as they have been found as far north as the Elk River in Webster County.

UPPER GILBERT SANDSTONE.

The Upper Gilbert Sandstone of Hennen and the writer[17], coming a short distance under the Eagle Limestone and Shale, and being apparently well represented across the counties intervening between its type locality in Logan and the territory of this Report, seems to be present generally through the Pickens region. It is gray and massive and 20 to 30 feet thick as shown by various sections in Chapter IV. So far as known it has not been quarried.

GILBERT COAL.

The Gilbert Coal of Hennen and the writer[18], belonging a few feet under the Upper Gilbert Sandstone, appears to be represented at a few localities in western Randolph. Near the village of Adolph, Middle Fork District, a coal is mined locally along the Middle Fork River, that belongs about 620 feet below the horizon of the Lower Kittanning Coal, and seems to correspond to the Gilbert. In this region it is usually free from partings, medium-hard, and varies from 1 to 2½ feet in thickness. Its crop where it is believed to be of value is shown on Map IV, and its areal extent, character, and thickness, together with detailed bed-sections will be discussed in Chapter XI, under the subject of "Coal".

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[16] I. C. White, Bull. 65, U. S. Geol. Survey, pp. 140 and 177 1891; and Vol II, W. Va. Geol. Survey, p. 593; 1903.

[17] Logan-Mingo Report, W. Va. Geol. Survey, pp. 217-218; 1914.

[18] Logan-Mingo Report, W. Va. Geol. Survey, pp. 221-222; 1914.

GENERAL DESCRIPTION, THE NEW RIVER GROUP.

The New River Group or Middle Pottsville of White[19], occurring in its typical development along the New River in southern West Virginia, is apparently represented by the lower coals of western Randolph, being 300 to 350 feet thick, as shown by the general section of the Pottsville Series, pages 264-6. In its general appearance it is very much like the Kanawha Group above it, having massive gray sandstones, and sandy shales, with coal seams occurring in the shales between the sandstone ledges. The coals, however, are nearly all of the typical, soft, New River type, in contrast to the harder coals of the Kanawha Group, and this feature has been used as the line of distinction between the two groups. It is possible that further detailed study in Webster and Nicholas may cause a revision, but the best information now available would place the base of the Kanawha Group at the bottom of the Gilbert Coal, which has been opened at Adolph, leaving the remaining lower coals in the New River Group.

DESCRIPTION OF MEMBERS, NEW RIVER GROUP.

NUTTALL SANDSTONE.

The Nuttall Sandstone of I. C. White, described in previous publications of the Survey[20] as a "great sandstone and conglomerate horizon", forms the top of the New River Group. This member is often split into two distinct cliffs, as explained by Hennen[21], the name of Nuttall being retained for the upper ledge. This member seems to be represented in Randolph by a massive, gray ledge, 10 to 20 feet thick, coming a few feet under the Gilbert Coal, but lacks the bold cliff-forming qualities that distinguish it at its type locality in Fayette County.

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[19] I. C. White, Bull. 65, U. S. Geol. Survey, pp. 202-3; 1891; and Vol. II(A), W. Va. Geol. Survey, pp. 13 and 179; 1908.

[20] I. C. White, Vol. II, W. Va. Geol. Survey, p. 616; 1903; and Vol II(A), pp. 253-254; 1908.

[21] Ray V. Hennen, Wyoming-McDowell Report, W. Va. Geol. Survey p. 180; 1915.

LOWER NUTTALL SANDSTONE.

The Lower Nuttall Sandstone of Hennen[22] is apparently separated from the Nuttall in Randolph by only a few feet of sandy shales without any intervening coal horizon. It is a coarse, gray, massive ledge, often making a cliff, 20 to 40 feet thick along the head of the Back Fork of Elk where it has been identified, but lacks the quartz pebbles that distinguish it along the Gauley River through Fayette and Nicholas Counties. In the Back Fork region it belongs 150 to 200 feet above the Sewell Coal.

HUGHES FERRY COAL.

The Hughes Ferry Coal of White[23], coming just below the Lower Nuttall Sandstone, is present in good development over a considerable portion of western Randolph, where its usual interval above the Sewell Coal is 150 to 175 feet. At Hartridge on the Buckhannon River, where the Sewell Coal was once mined commercially, the Hughes Ferry has been prospected in the mountain immediately above the mine, coming at an interval of 177 feet, hand-level measurement, above the Sewell. Here it is soft, columnar, and 2 feet thick, presenting much the same appearance as at other points in the county where it was identified. Its outcrop, where it is known or believed to be of possible minable thickness, is shown on Map IV, and its areal distribution, thickness, and chemical character, together with detailed bed-sections, will be discussed in Chapter XI, under the subject of "Coal".

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[22] Ray V. Hennen, Wyoming-McDowell Report, W. Va. Geol. Survey, p. 182; 1915.

[23] I. C. White, Vol. II(A), W. Va. Geol. Survey, pp. 252-253; 1908.

MIDDLE IAEGER SANDSTONE.

The Middle Iaeger Sandstone of Hennen[24], apparently fills the gap between the Hughes Ferry and Lower Iaeger Coals in the Pickens region, being usually 15 to 25 feet thick, gray and massive, as shown by various sections in Chapter IV. So far as known it has not been quarried.

LOWER IAEGER COAL.

The Lower Iaeger Coal of Hennen[25], coming just under the Middle Iaeger Sandstone, seems to be represented by a thin coal that is noted in some of the diamond drill borings of the Elkhorn Coal Corporation, made in the Hartridge region, the records of which are published in Chapter XI. Its interval below the Hughes Ferry Coal is shown to be 36 feet in the section for Hartridge, published on page 177, and its thickness 1′ 6″. This coal was also noted by Teets at the **James Morgan Exposure, No. 1027C on Map IV,** on Bear Camp Run, 1 mile westward from Palace Valley, where it is 1′ 6″ thick, at an elevation of 2095′ B. It was noted on Back Fork of Elk River at the **Holly Lumber Company Prospect—No. 1027B on Map IV,** located on Zimmerly Run, 1.8 miles south of the Parting Springs, with a thickness of 1′ 11″ and an elevation of 3120′ B. Not enough exposures of this bed were found to class it as a minable coal.

HARVEY CONGLOMERATE.

The Harvey Conglomerate of Campbell[26], belonging a few feet under the Lower Iaeger Coal, is apparently represented in western Randolph by a coarse, gray, massive stratum, 20 to 40 feet thick, but it lacks much of the cliff-forming quality that makes it a conspicuous feature in its type locality in Raleigh County, and it does not carry quartz pebbles. Its presence is noted in some of the sections of Chapter IV. So far as known, it has not been quarried.

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[24] Ray V. Hennen, Wyoming-McDowell Report, W. Va. Geol. Survey, p. 190; 1915.

[25] Ray V. Hennen, Wyoming-McDowell Report, W. Va. Geol. Survey, p. 190; 1915.

[26] M. R. Campbell, Raleigh Folio No. 77, U. S. Geol. Survey; 1902.

CASTLE COAL.

The Castle Coal of Hennen[27], belonging between the Harvey Conglomerate and the Guyandot Sandstone, is apparently represented by a coal that has been prospected on Middle Fork River near Cassity, where, as shown by the section for that place, page 170, there is a coal coming at an interval of 627 feet below the top of the Homewood Sandstone and 124 feet above the Sewell Coal. Here the coal is reported to be 2 to 2½ feet thick, only one foot of coal being visible at the prospect which had fallen partly shut, and which had an elevation of 2180' B., being about 170 feet above Middle Fork River. It is a soft columnar coal similar to the other seams of the New River Group. Its areal distribution, thickness, and chemical character, together with detailed bed-sections, will be discussed in Chapter XI.

GUYANDOT SANDSTONE.

The Guyandot Sandstone of Campbell[28] is apparently represented in Randolph by a gray, massive ledge, coming a few feet under the Castle Coal. In the section for Cassity, page 170, it is noted, being 25 feet thick. It is also reported in other sections in Chapter IV, having a thickness of 25 to 50 feet. So far as known it has not been quarried.

SEWELL "B" COAL.

The Sewell "B" Coal of Hennen[29] appears to be represented in Randolph by a coal that, according to Teets, has been opened on the Left Fork of Buckhannon River, 1.1 miles southwest of Star, as shown by the following section:

Elkhorn Coal Corporation Prospect—No. 1036 on Map IV.

	Ft.	In.
Slate, black, visible	8	0
Coal, soft, Sewell "B" (2740' B.)	2	5
Concealed to Sewell Coal	47	0

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[27] Ray V. Hennen, Wyoming-McDowell Report, W. Va. Geol. Survey, pp. 193-194; 1915.

[28] M. R. Campbell, Raleigh Folio No. 77, U. S. Geol. Survey; 1902.

[29] Ray V. Hennen, Wyoming-McDowell Report, W. Va. Geol. Survey pp. 195-196; 1915.

A sample collected from this opening is published under **Mine No. 1036** in the table of coal analyses at the end of Chapter XI.

In Chapter IV this coal is noted in some of the sections for this region and in Chapter XI it is recorded in some of the diamond drill borings of the Elkhorn Coal Corporation. At the **Davis and Elkins Prospect (No. 1037 on Map IV)**, at the head of Hewett Fork of Back Fork of Elk, 2.5 miles northwest of Monterville, Mingo District, Randolph, the coal has been opened at an elevation of 3720′ B., being 25 feet above a nearby opening in the Sewell bed. The prospect showed 2 feet of clean coal and may not have represented the full thickness as it was not dug far into the mountain. It is possible that the Sewell "B" Coal may furnish some valuable fuel in Mingo and Middle Fork Districts, Randolph, although there have not been enough prospects in it to insure that it is continuous over any extensive area.

LOWER GUYANDOT SANDSTONE.

The Lower Guyandot Sandstone of Hennen[80], belonging a few feet above the Sewell Coal, is apparently represented in Randolph by a massive, gray ledge, 10 to 20 feet thick, that is visible at some of the openings in the coal in the Pickens and Point Mountain regions. So far as known, it has not been quarried.

HARTRIDGE BLACK SHALE.

At the village of Hartridge, on the Left Fork of Buckhannon River, Middle Fork District, Randolph, where the Sewell Coal was formerly mined by Hart Brothers, on land now owned by the Elkhorn Coal Corporation, a black shale, 5 to 6 feet thick, occurs just over the coal, and contains **Naiadites elongata** fossils in profusion. The shale varies in color from dark-gray to black, the fossils being usually found in hard, black concretions that occur in great numbers scattered throughout the shale. This shale proved to be a valuable aid in

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[80] Ray V. Hennen, Wyoming-McDowell Report, W. Va. Geol. Survey, pp. 196-197; 1915.

PLATE XVII.—Saltsburg Sandstone outcropping one mile southeast of Reger, Upshur County, mostly covered with vegetable mosses and other fungus growths.

tracing the Sewell Coal, and as it has not been previously named or described, it will be called the **Hartridge Black Shale** in this Report.

On Mill Creek, 2.6 miles due west of Lee Bell, Huttonsville District, Randolph, the Hartridge Black Shale was observed by Teets and the writer coming immediately over an old mine in the Sewell Coal, and being 5 feet thick, black in color, and having hard, black, fossiliferous concretions, similar to those at Hartridge. The same fossils were observed above the blossom of the Sewell Coal, on the head of Stone Run of Elkwater, 2.8 miles northwest of Monterville, at an elevation of 3475′ B., and on Long Run, Middle Fork District, Randolph, 1.7 miles north of Cubana, 55 feet above the top of the Sewell Coal, **Naiadites elongata** were found that may be at the same horizon. The same black shale was noted over the coal at numerous points in the Rich Mountain country and it is likely that the fossils could be found at many of these points but they were not found at Hartridge until after many of these mines had already been visited.

In the section for Rowlesburg, Reno District, Preston County, made by Hennen and the writer and published in the Preston Report, pages 97-101, a black shale is noted just over the Sharon Coal, being 5.6 feet thick, and coming 66 feet above the base of the Pottsville Series. On a recent trip to this locality, made by Hennen, Dr. Price, and the writer, **Lingula umbonata** and **Lingula kanawhensis** were found in this shale, and at another shale horizon 91.3 feet above the base of the Pottsville, **Lingula umbonata, Naiadites,** and **Deltopecten flabellum** were found, coming above a 3-inch streak of coal that is noted in the Rowlesburg Section. It is the expressed belief of Mr. Hennen that the latter fossil horizon possibly represents the Eagle Limestone and Shale of Kanawha County, as the fossils are similar and the soft coal coming 10 feet above the top of the shale is similar in character to the Eagle Coal and typical of those in the lower portion of the Kanawha Group. It is the belief of the writer that the lower fossil horizon at Rowlesburg correlates with the Hartridge Black Shale, as it is only a few feet above the top of the great pebbly cliff rock that forms the base of the Pottsville Series all the way southward along the crest of the Laurel Ridge and Rich Mountain to Hartridge and Mill Creek where the fossils are again found, at an interval of 50 to 75 feet above the top of the ledge. Dr. Price reports that the same fossils are found in Maryland just over the Sharon Coal.

SEWELL COAL.

The Sewell Coal of White[81], named from Sewell Mountain, Fayette County, and belonging in that locality about 300 feet below the Nuttall Sandstone, and 60 to 80 feet above the Upper Raleigh Sandstone, is the most valuable and persistent seam in the entire Pottsville in Randolph. It is usually a soft columnar coal, 3 to 5 feet thick, and at the base almost always has about one foot of bony or slaty coal which is its main distinguishing feature in the Rich Mountain region. It was studied by Dr. I. C. White several years ago in this region and given the provisional name of "Mill Creek Coal"[82], together with the statement that it might possibly correlate with the Sewell. This coal has now been traced by Hennen and the writer through Fayette, Nicholas, and Webster, with the result that there seems to be no further doubt as to its identity with the Sewell, and the name of "Mill Creek" can therefore be abandoned. At Mill Creek and Hartridge, it is distinguished by the presence of the black, fossiliferous Hartridge Shale above it and this formation usually accompanies the coal all the way across Webster County where it has been frequently mined. Its position in the series varies from 50 to 150 feet above the base of the Pottsville, the great thickness of the sandstone conglomerate at the base often bringing it to the latter figure. The crop of the Sewell Coal is shown on Map IV in those regions where it is believed to be of value, and in Chapter XI it will be discussed in full, with numerous bed-sections and chemical analyses, together with an estimate of its areal extent and tonnage.

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[81] I. C. White, The Virginias, pp. 7-16; January, 1885; Bull. 65, U. S. Geol. Survey, p. 197; 1891; and Vol. II, W. Va. Geol. Survey, pp. 657-665; 1903.

[82] I. C. White, Vol. II(A), W. Va. Geol. Survey, p. 238; 1908.

The evidence offered by the fossiliferous Hartridge Black Shale, and by the presence of a great conglomerate sandstone at the base of the Pottsville, both of which appear at Rowlesburg, Preston County, as mentioned above under the description of the shale, seems to indicate that the Sewell Coal is the Sharon of western Pennsylvania. The writer has traced the great conglomerate ledge all the way along Rich Mountain and Laurel Ridge from Mill Creek to Rowlesburg, finding the very significant fact that no intermediate conglomeratic sandstones occur in this region between the great Upper Connoquenessing Sandstone and the ledge at the base of the Pottsville, the interval between them at Rowlesburg being 83 feet and in the Mill Creek and Hartridge regions about 700 feet. Dr. White's identification of the Mill Creek Coal with the Sewell having proved correct and there being no evidence to dispute that the Sharon Coal is correctly named in the Rowlesburg Section, then the Sharon Coal of Pennsylvania proves to be the Mill Creek Coal of Randolph and the Sewell of Fayette, as long ago claimed by Dr. David White, Chief Geologist of the U. S. Geological Survey, from the evidence of fossil plants.

WELCH SANDSTONE.

The Welch Sandstone of Hennen[83], belonging between the Sewell and Welch Coals, is represented in Randolph by a gray massive ledge 10 to 30 feet thick, as shown by various sections in Chapter IV. So far as known, it has not been quarried.

WELCH COAL.

The Welch Coal of White[84], belonging 60 to 70 feet below the Sewell Coal and 0 to 10 feet above the Upper Raleigh Sandstone at its type locality at Welch, McDowell County, has not been opened in Randolph, so far as known, but its presence in Webster near the Randolph Line would indicate that further prospecting might find it. As observed in Webster, it is soft, columnar, single-bedded, and from 1 to 4 feet thick. In the section for Waneta, page 182, it is reported 1 foot thick, coming 25 feet below the Sewell Coal.

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[83] Ray V. Hennen, Wyoming-McDowell Report, W. Va. Geol. Survey, p. 198; 1915.

[84] I. C. White, Vol. II, W. Va. Geol. Survey, pp. 666-667; 1903.

SHARON (UPPER RALEIGH) SANDSTONE.

The Sharon Conglomerate Sandstone of the Pennsylvania geologists is the most conspicuous sandstone ledge of the New River in Randolph. It is the lowest member of the Group, having its base 100 to 150 feet below the Sewell Coal and coming immediately above the Mauch Chunk Reds. Along the summit of Rich Mountain, nearly all the way from West Huttonsville to the gorge of the Tygart Valley River, a distance of fourteen miles, this great white sandstone conglomerate forms the crest of the ridge. On the east side next to the river, the soft red shales of the Mauch Chunk crop just under the great ledge and on the west side the measures dip rapidly, soon causing the conglomerate ledge to dip below the mountain slope, so that its principal exposure is along the brow of the escarpment, showing often in both the gaps and on the tops. North of the Tygart Valley, the same ledge forms the crest of the Laurel Ridge which is merely a northward extension of Rich Mountain, and it may be traced all the way through northern Randolph, eastern Barbour, and Preston to Rowlesburg, where the Cheat River again cuts through the range. Throughout all this distance, it preserves its pebbly character, although at the northern end of the Laurel Ridge near Rowlesburg, the ledge is not so thick or the quartz pebbles so large and numerous as at southern points along Rich Mountain. In view of the fact that no other conglomerate ledge is found in the Pottsville of this region below the great Upper Connoquenessing Sandstone, which is separated from the Rich Mountain ledge by an interval of 83 feet at Rowlesburg, and by an expanded interval of about 700 feet at the southern end of Rich Mountain, the writer has no hesitation in declaring his belief that the **Rich Mountain Conglomerate** of this region, often so called from its abundant exposure along that range, will prove to be the **Sharon Conglomerate** of western Pennsylvania. Furthermore, since Dr. White's correlation of the Mill Creek Coal with the Sewell seems established, then the Rich Mountain or Sharon Conglomerate becomes the Upper Raleigh Sandstone of the southern counties, and the interval between the Upper Connoquenessing Sandstone and the Upper Raleigh, which is only 83 feet at Rowlesburg, has greatly expanded in the southern end of the State.

The Sharon Conglomerate, as observed in the counties of this Report, is a great white sandstone ledge, varying from 30 to 80 feet in thickness, and almost always having great quantities of white quartz pebbles, varying from one-half inch to two inches in diameter. Besides its abundant exposure along the Laurel Ridge and Rich Mountain, it is exposed along the Middle Fork River where the Hiram Anticline crosses below Cassity, and also along the Left Fork of Buckhannon River, where the same anticline crosses between Hartridge and Star. In this region the cliff attains its most notable development in the county, being 75 feet or more in thickness and having pebbles 2 inches in diameter. It is also visible along Mill Creek 2.5 miles west of Lee Bell, where Dr. White calls it the Raleigh Sandstone on page 238 of Volume II(A). South of Mill Creek, the ledge rises to the ridge between Mill Creek and Elkwater, forming the summit of Cherry Knob and being visible at numerous points southwestward. Along the southern front of Point Mountain, its horizon is exposed below the Mill Creek (Sewell) Coal.

CHAPTER IX.

STRATIGRAPHY—THE MISSISSIPPIANAND DEVONIAN ROCKS.

THE MISSISSIPPIAN PERIOD.

The Mississippian, or Lower Carboniferous Measures, as commonly classified in the Appalachian region, include the Mauch Chunk, Greenbrier Limestone, and Pocono Sandstone Series. These rocks crop to the surface at only a few points in the area of this Report, making it impossible to study them in detail.

MAUCH CHUNK SERIES.

The Mauch Chunk Series, named for its occurrence near the city of that name in eastern Pennsylvania, coming just below the Pottsville, consists mainly of red shale, with occasional beds of green or dark shale and a few green, flaggy sandstones, with a thin limestone stratum near the base. Its thickness in northwestern Barbour and northern Upshur, as determined from oil well records, is from 200 to 300 feet, but in western Randolph it thickens to about 600 feet in the region of Rich and Point Mountains.

In Barbour, Map II shows that the series crops in Cove District along Brushy Fork of Teter Creek, east of Valley Furnace, and in Glade District on Mill Run, east of Kirt. In Upshur it does not crop at all, but in Randolph it is exposed along the Tygart Valley River where this stream cuts through the Laurel Ridge and Rich Mountain above Roaring Creek Junction, in Leadsville and Roaring Creek Districts. Just east of the Laurel Ridge and Rich Mountain, the Mauch Chunk is exposed along the mountain front just below the base of the Pottsville which forms the ridge nearly all the way. In Middle Fork District, in crops again on the Middle Fork River, 1.5 miles northwest of Cassity, at the point where the Hiram Anticline crosses the river, 30 to 40 feet of the reds being exposed, and the crop extends down the river about one mile and a half. It crops again in the same District on the Left Fork of Buckhannon River at the mouth of Beech Run, being brought above drainage by the same anticline, and only about 50 feet of the top being above drainage. Along the Back Fork of Elk, in Middle Fork and Mingo Districts, it crops again for several miles, but the drainage does not cut to the base of the series. South of Point Mountain along Valley Fork of Elk and east of Rich Mountain on Mill Creek and Elkwater, the entire series is exposed, being brought above drainage by the southeastward rise of the rocks, and along the latter stream the sandstones are coarser than in any other region noted in the area of this Report, quartz pebbles being frequently found in some of them.

In Chapter IV the partial or entire thickness of the Mauch Chunk Series is noted, either in borings or surface measurements, in the sections for Astor, Bear Knob, Cassity, Century, Cleveland, Craddock, Frenchton, Laurel Branch of Middle Fork, Laurel Ridge, Lost Run of Middle Fork, Newlon, Overfield, Palace Valley, Philippi, Sago, Samp, Stockerts, Sunny Point, and Turkey Run.

Economically, the Mauch Chunk Series amounts to little, except as a soil maker. The sandstones are too shaly or flaggy to be used for building purposes. One of these beds represents the **Maxton Oil Sand** of the western counties, but, so far as known, it has never produced oil or gas in the counties under discussion. It is possible that the red shales could be used for making brick for paving or building purposes.

No marine fossils were noted in the Mauch Chunk, but fossils are sometimes found in the Little Lime at the base and at a few points in southern West Virginia, where the series is greatly expanded, they have been found at other horizons

GREENBRIER LIMESTONE.

The Greenbrier Limestone, named for its occurrence along Greenbrier River, West Virginia, and corresponding to the St. Louis, Maxville, and Mountain Limestone of various surrounding State Surveys in the Appalachian Basin, and coming between the Mauch Chunk Shales above and the Pocono Sandstones below, is usually a hard gray limestone stratum, varying in the region of this report from 50 feet thick in northern Barbour to about 250 feet in the mountain region of western Randolph. It is characterized by marine fossils in profusion, Crinoids and Brachiopods being among the more prominent types.

In Barbour, as shown by Map II, the Greenbrier crops along Mill Run, 1.5 miles southeast of Kirt, where at the **Perry Lawson Quarry,** 50 feet of the ledge was visible, the whole formation not being exposed. Here the stone has been used for agricultural lime with good results, being hard and pure, and carrying marine fossils, among which **Crinoids** and **Derbya** were noted. A sample of the lime collected at this point gives the following analysis, according to Hite and Krak:

	Per cent.
Silica (SiO_2)	12.62
Ferric Iron (Fe_2O_3) and Alumina (Al_2O_3)	3.56
Calcium Carbonate ($CaCO_3$)	80.40
Magnesium Carbonate ($MgCO_3$)	2.26
Phosphoric Acid (P_2O_5)	0.36
Loss on ignition	1.18
Total	100.38

In Upshur the Greenbrier does not crop at all, but in Randolph its horizon is above drainage in Leadsville and Roaring Creek Districts where the Tygart Valley River cuts through the Laurel Ridge and Rich Mountain, but its presence was not noted there along the railroad cuts north of the river, there being too much debris. East of the summit of these mountains, it crops in a long belt, usually only a short distance below the top of the ridge. In Huttonsville District, the ledge was noted along Mill Creek and Elkwater, and in Mingo District, it was observed along Valley Fork and main Elk, having sandy ledges and bands of red shale between the limestone deposits.

In Chapter IV the Greenbrier Limestone is noted in the sections for Astor, Bear Knob, Century, Cleveland, Craddock, Frenchton, Newlon, Overfield, Philippi, Sago, Samp, Stockerts, Sunny Point, and Turkey Run, and in Chapter X, its thickness will be given in several tests for oil and gas.

Economically, the Greenbrier Limestone is a most important horizon. It is adapted to the manufacture of agricultural lime and Portland cement, and when crushed makes excellent road macadam or concrete aggregate. In the oil fields of the State, it is known by the drillers as the **"Big Lime"**, forming a valuable "key-rock" on which to base the correlation of the lower oil sands. In some of the southern counties of the State, it has produced some gas and a little oil in regions where it is sandy, but, so far as known, it has not been found productive in the area of this Report.

POCONO SANDSTONE SERIES.

The Pocono Sandstones, named from Pocono Mountain, Pennsylvania, and consisting mainly of gray sandstones and gray shales, with occasional streaks of red, has only a limited crop in the territory of this Report, as shown by Maps II and IV. In Barbour it is exposed along Mill Run, east of Kirt, Glade District, and in Randolph its horizon is above drainage in Leadsville and Roaring Creek Districts, where the Tygart Valley cuts through the mountains. Just east of the Laurel Ridge and Rich Mountain, it crops in a broad belt half-way down the mountain slope, but as this region is out of the bounds of this volume, it was not studied in detail. Along Mill Creek and Elkwater in Huttonsville District its horizon is exposed, and on the latter stream great pebbly boulders of it may be found in profusion, the pebbles being easily distinguished from those of the Pottsville by their flattened, oblong shape, due to sliding friction along an old shore-line. South of Point Mountain in Mingo District, it makes a thick ledge along the Valley Fork of Elk.

The Pocono has been penetrated by several tests for oil and gas, the records of most of which will be published in Chapter X. In Chapter IV it is noted in the sections for Astor, Bear Knob, Century, Cleveland, Craddock, Frenchton, Newlon, Overfield, Philippi, Sago, Stockerts, Sunny Point, and Turkey Run, where its thickness varies from 250 to 450 feet.

Economically the Series is valuable chiefly for the oil and gas horizons that it contains, among which the **Big Injun Sand,** coming usually at the top of the Series, is the most prolific oil horizon of the State, and the Berea, at the base of the Series, ranks close after the Injun. Some of these sand members have produced gas commercially in Upshur and Barbour, as will be fully discussed in Chapter X.

No marine fossils were noted in the Pocono in either county, and the series does not usually contain them, although their presence has been noted at a few points in the State.

THE DEVONIAN BEDS.

The Devonian Beds, coming just below the Mississippian, are mapped at only one point in the bounds of this Report, the upper portion being exposed in eastern Barbour, as will be subsequently outlined, only the Catskill and Chemung Series being above drainage.

CATSKILL SERIES.

The Catskill Series, coming at the top of the Devonian, and being composed of red or brown sandstones, separated by red or green shales, and usually having a total thickness of 400 to 700 feet, is exposed along Mill Run, Glade District, Barbour, where the eastward rise of the rocks brings it above drainage as shown by Map II. It was not possible to get an accurate measurement of it here, owing to the steep pitch of the rocks, but in Chapter IV, its thickness, either partial or entire, is exhibited by boring records in the sections for Astor, Bear Knob, Century, Cleveland, Craddock, Frenchton, Newlon, Overfield, Philippi, Sago, Sunny Point, and Turkey Run.

Economically the Catskill Series is of only fair value as a soil maker, but its sandstone members compose the famous Venango or Catskill Group of oil and gas sands, that have produced a large amount of these products in the western counties of the State, the Gordon Sand being the most prolific and ranking, with the Berea, soon after the Big Injun. These members have been pierced by the drill at numerous tests in Barbour and Upshur, the results in most of them being discouraging, as will be shown by their published records in Chapter X.

So far as known, the Catskill contains no marine fossils, conditions evidently not having been favorable to the growth of animal life at the time of its deposition, aerial conditions having largely predominated.

CHEMUNG SERIES.

The Chemung Series of the Devonian, coming just below the Catskill, and consisting of thin flaggy sandstones, hard, fine-grained, and much ripple-marked, separated by thick beds of shale, the whole having a prevailing olive-green color, and a possible thickness of 1200 to 1500 feet, is shown on Map II, only in the same region on Mill Run noted above for the Catskill. The sediments are distinctly marine, there being an abundance of Crinoids, Spirifer, and other types. The boundary between the Catskill and Chemung is sometimes indistinct, as there are occasional streaks of red in the upper portion of the Chemung and green shales are often found in the lower part of the Catskill, but the marine fossils, when found, seem to be positive proof of the Chemung, and often, also, at the top of this series there is a thin bed of conglomeratic sandstone, the quartz pebbles of which have been so much worn by sliding friction on marine beaches that they present a flattened, oblong appearance.

Economicaly, the Chemung Series is of negative quality, making only an indifferent soil, and having no massive ledges suitable for quarrying. It is possible that some of the softer shale beds could be made into a fair grade of brick, but, in general, they are too sandy to mold well. In Pennsylvania some of the sandstone members of the Chemung hold oil and gas, but no commercial production has been found in them in West Virginia, although shows of both oil and gas are occasionally found. The series has been drilled into at various points in the territory of this Report, the records of most of these holes being published in Chapter X. In Chapter IV the Chemung is noted in the sections for Bear Knob, Century, Overfield, Philippi, and Sunny Point.

PART III.

Mineral Resources

CHAPTER X.

PETROLEUM AND NATURAL GAS

OIL AND GAS HORIZONS.

Barbour, Upshur, and the western portion of Randolph are situated just at the eastern edge of the great oil and gas fields of the State. Harrison County, just west of Barbour, has produced both oil and gas in abundance, and the same statement is true of Lewis County, just west of Upshur. In Barbour and Upshur, about fifty wells have been drilled for oil, with the result that numerous oil showings have been found and some of the wells would have made light pumpers if they had been near enough to the pipe-lines to justify their operation, and in two or three localities gas has been found in commercial quantity. The presence of these small gas pools and showings of oil indicate that others will probably be found, but the numerous dry holes at many intermediate locations indicate that much of the territory in these two counties will be barren. In western Randolph only a few tests have been drilled, all of which have been failures, and the close proximity of this region to the Alleghany Mountain uplifts, where the main oil and gas sands of the State are brought above drainage, indicates that much, if not all, of this territory has no oil or gas in commercial quantity, as most of the gas has evidently escaped from the sands where their outcropping edges are exposed along the Tygart Valley, and the oil originally in these sediments has probably migrated westward by gravity down the slope of the rocks toward the great Appalachian Geosyncline, which passes through the western part of the State.

The wells that have been drilled range in depth from only a few hundred feet to nearly 5000 feet in some of the recent holes. Throughout most of Barbour and Upshur, the known producing horizons of the State may be drilled through at less than 2500 feet and the deep tests that have been made were intended to test for lower sands that have been productive in parts of Pennsylvania and Ohio. Drilling is usually done with cable tools, three strings of casing being generally used, 10-inch, 8¼-inch, and 6⅝-inch, the latter being set in the Big Lime. When water or caving shales are found below the Big Lime, it is necessary to set an additional string of 5 3-16-inch at some lower level.

Some shows of oil and gas have been found in the Pennsylvanian, but most of it occurs in the Pocono Sandstone Series of the Mississippian, and in the Catskill Series at the top of the Devonian. At least one well (No. 10 on Map II) has made some gas from a horizon far below the base of the Catskill. The Big Lime has not produced oil and gas in commercial quantity in either county, although shows of both have been found in it at several points. Salt water is usually found in abundance in the great sandstones of the Pottsville, and it also occurs at some localities in the Big Injun Sand just below the Big Lime, but below the Big Injun it is not often, if ever, recorded in these counties.

The following classification of the various oil and gas sands of the State, taken with slight revisions from former Reports of the Survey[1], gives not only the sands that have produced shows of oil and gas in Barbour and Upshur (printed in black type), but also the other known productive horizons of other counties and some that have produced oil

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[1] See Monongalia-Marion-Taylor Report, p. 388; and Lewis-Gilmer Report, p. 176.

in northwestern Pennsylvania and that seem to be prese
in some of the deep wells of this Report:

Oil and Gas Horizons of West Virginia.

Monongahela Series.........	Carroll Sand (Uniontown).
Conemaugh Series...........	Minshall Sand (Connellsville). Murphy Sand (Morgantown). Moundsville Sand (Saltsburg). First Cow Run (Little Dunkard) Sand (Buffalo). Big Dunkard Sand (Mahoning).
Allegheny Series............	Burning Springs Sand (Upper Freeport. Gas Sand of Marion and Monongalia Counties (Lower Freeport).
Pottsville Series............	Second Cow Run of Ohio (Homewood). Gas Sand of Cairo. Salt Sand of Cairo. Cairo? Gas Sand of Rosedale. Salt Sand of Rosedale (Sharon Conglomerate).
Mauch Chunk Red Shale....	Maxton, Dawson, Cairo. Little Lime.
Greenbrier Limestone.......	"Big Lime", not generally productive.
Pocono Sandstones..........	Keener Sand and Beckett Sand of Milton. Big Injun Sand. Squaw Sand. Weir Sand. Berea Sand.
Catskill Red Beds...........	Gantz Sand. Fifty-foot Sand. Thirty-foot Sand. Gordon Stray Sand. Gordon Sand. Fourth Sand. McDonald or Fifth Sand. Bayard or Sixth Sand. Elizabeth or Seventh Sand.
Chemung and Portage Beds..	Warren First Sand. Warren Second Sand. Clarendon or Tiona Sand. Speechley Sand. Balltown or Cherry Grove Sand. Sheffield or Cooper Sand. Benson, Bradford? or Deer Lick Sand. Elk or Waugh and Porter Sand. Kane Sand.

In the table above a correction is made in the position of the "Gas Sand" of Marion and Monongalia Counties which is placed in the Allegheny Series where it belongs, instead of at the top of the Pottsville where it has been incorrectly placed in several previous Reports, due to a typographical error that was carried through several volumes. A correction is also made by placing the name of Buffalo Sandstone after the Little Dunkard Sand, instead of after the Moundsville, where it appeared, through error, in the Lewis-Gilmer Report. The names and succession of the sands of the Chemung and Portage Beds are taken from the table of the late F. H. Oliphant[2], who classified them in northwestern Pennsylvania and western New York, the Benson Sand being a new title. Several of these lower sands were found in some of the deep wells noted in the present Report and their tentative correlation is suggested in the records as they appear on subsequent pages of this Chapter.

In Barbour and Upshur, oil and gas shows have been found in sands ranging between the Second Cow Run and the Benson. Above and below these two sands no productive horizons are known to have been found.

In the following table, the approximate intervals of the various sands from the three principal "key-rocks", the Pittsburgh Coal, Lower Kittanning Coal, and top of the Big Lime, are given for several localities. In Barbour the intervals for Philippi are very near the truth for all of the northern and western parts of the county. In the southern end, near Belington, no holes have been drilled for oil or gas and no intervals can be given. In Upshur the intervals recorded for Buckhannon are adapted for all the northwestern part of the county, including the Stonecoal Gas Field, and those for Queen should fit the northwestern portion of Randolph as well as eastern Upshur. No intervals are given from the Pittsburgh Coal horizon in those regions where it is far above the hilltops and the Lower Kittanning has been used as the "key-rock" for the structure contours on Maps II and IV. **Black-faced type** indicates that the sand is above the "key-rock" named at the top of the column and plain type indicates that it is below the "key-rock":

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[2] See Vol. I(a), W. Va. Geol. Survey, pp. 84-85; 1904.

Table of Oil and Gas Sand Intervals.

(Black-faced type indicates that the sand is above the "key-rock" at the top of the column, and roman type indicates that it is below the "key-rock").

Sand.	Philippi.			Buckhannon.			Queen.		Craddock		Frenchton	
	Pittsburgh Coal.	Lower Kittanning Coal.	Top of Big Lime.	Pittsburgh Coal.	Lower Kittanning Coal.	Top of Big Lime.	Lower Kittanning Coal.	Top of Big Lime.	Lower Kittanning Coal.	Top of Big Lime.	Lower Kittanning Coal.	Top of Big Lime.
Carroll	**300**	**1050**	**1875**	**275**	**1050**	**1950**	....	....	....	....	....	....
Minshall	125	**650**	**1450**	125	**650**	**1550**	....	....	....	....	....	....
Murphy	250	**525**	**1325**	250	**525**	**1425**	....	....	....	....	....	....
Moundsville	400	**375**	**1175**	400	**375**	**1275**	....	....	....	....	**375**	**1500**
First Cow Run	500	**275**	**1075**	500	**275**	**1175**	....	....	....	....	475	**1400**
Big Dunkard	600	**175**	**975**	600	**175**	**1075**	....	....	....	....	575	**1300**
Burning Springs	675	**100**	**900**	675	**100**	**1000**	....	....	....	....	675	**1200**
Gas, of Marion	725	**50**	**850**	725	**50**	**950**	....	....	....	....	725	**1150**
Second Cow Run	800	25	**800**	800	25	**875**	25	**1300**	25	**1525**	25	**1050**
Gas of Cairo	....	....	....	....	....	....	....	....	....	....	....	....
Salt, of Cairo	....	....	....	....	....	....	....	....	....	....	....	....
Gas of Rosedale	1050	425	**400**	1250	475	**400**	700	**600**	900	**625**	475	**575**
Salt, of Rosedale	1150	525	**300**	1350	575	**300**	800	**500**	1000	**525**	575	**475**
Maxton	1425	675	**150**	1525	750	**125**	1200	**100**	1450	**100**	900	**150**
Little Lime	1500	750	**75**	1600	825	**50**	1250	**50**	1500	**50**	1000	**50**
Big Lime	1550	800	0	1650	875	0	1300	0	1550	0	1050	0
Keener	....	....	....	....	....	....	....	....	....	....	....	....
Big Injun	1650	900	100	1750	975	100	1400	100	1700	150	1150	100
Squaw	1775	1025	225	1875	1100	225	1500	200	1800	250	1250	200
Weir	1850	1100	300	1950	1175	300	1575	275	1850	300	1350	300
Berea	1925	1175	375	2025	1250	375	1650	350	1900	350	1450	400
Gantz	1975	1225	425	2100	1325	450	1725	425	2000	450	1500	450
50-Foot	2025	1275	475	2150	1375	500	1825	525	2075	525	1575	525
30-Foot	2125	1375	575	2225	1450	575	1900	600	2150	600	1650	600
Gordon Stray	2200	1450	650	2275	1500	625	1950	650	2225	675	1700	650
Gordon	2275	1525	725	2325	1550	675	2000	700	2300	750	1750	700
Fourth	2375	1625	825	2400	1625	750	2075	775	2375	825	1825	775
Fifth	2475	1725	925	2450	1675	800	2150	850	2450	900	1900	850
Sixth	2550	1800	1000	2525	1750	875	2225	925	2550	1000	....	....
Seventh	2625	1875	1075	2600	1825	950	2300	1000	....	....	....	....
Warren First	2800	2050	1250	2850	....	....	....	....	....	....	....	....
Warren Second	3000	2250	1450	3100	....	....	....	....	....	....	....	....
Clarendon	3200	2450	1650	3350	....	....	....	....	....	....	....	....
Speechley	3500	2750	1950	3700	....	....	....	....	....	....	....	....
Balltown	3750	3000	2200	4000	....	....	....	....	....	....	....	....
Sheffield	4000	3250	2450	4200	....	....	....	....	....	....	....	....
Benson (Bradford?)	4350	3600	2800	4500	....	....	....	....	....	....	....	....
Elk	4550	3800	3000	....	....	....	....	....	....	....	....	....
Kane	4750	4000	3200	....	....	....	....	....	....	....	....	....

In the above table, no figures are given for the Gas and Salt Sands of Cairo as they could not be definitely identified in the numerous Pottsville sands among which they belong.

No figures are given for the Keener Sand because it is seldom found separate from the Big Injun in this territory.

DESCRIPTION OF SANDS.

The sands of the Monongahela, Conemaugh, and Allegheny Series, have proved to be productive only in the western part of the State where the strata dip to a low structural level. Nothing has been found in them in Barbour and Upshur, and since they are so near or above the surface at most localities, nothing is likely to be found in them. Their description is accordingly omitted from this Report.

SANDS OF THE POTTSVILLE SERIES.

Second Cow Run Sand.—The Second Cow Run Sand, named from Cow Run in Ohio, where it produces oil and gas in large quantities, is the highest member of the Pottsville Series. It has been called by various names in different localities, often being known simply as the "First Salt", and sometimes being confused with the "Gas Sand" of Marion. It belongs 750 to 800 feet below the Pittsburgh Coal, and 10 to 50 feet below the Lower Kittanning, and is 25 to 75 feet thick. It made a show of gas in the **Chas. M. Hyre No. 2656 (63) Well,** at Frenchton, but nothing except salt water is known to have been found in it elsewhere.

Gas and Salt Sands of Cairo and Cairo Sands.—Two or three members of the Pottsville Series hold oil and gas in the vicinity of Cairo, Ritchie County, and these sands are doubtless present in Barbour and Upshur, but they have not been certainly traced through the intermediate counties, the drillers usually recording them as the Salt Sands.

Gas Sand of Rosedale.—The "Gas Sand" of Rosedale, belonging, at its type locality, 1500 to 1525 feet below the Pittsburgh Coal and about 750 feet below the Lower Kittanning, is probably one of the producing horizons of the Lewis County Panhandle next to Upshur and may contain some oil and gas in the Little Kanawha region of southwestern Upshur. This sand possibly correlates with the Lower Guyandot Sandstone of the Pottsville Series. It usually contains large quantities of salt water.

Salt Sand of Rosedale.—The Salt Sand of Rosedale, coming about 1625 feet below the Pittsburgh or 850 feet below the Lower Kittanning Coal at Rosedale, and being the bottom member of the Pottsville Series, is probably identical with the great Sharon or Rich Mountain Conglomerate of Randolph. In Upshur and Barbour, its interval below the Lower Kittanning increases rapidly with the southward expansion of the Pottsville, as shown by the table of oil and gas sand intervals. It contains salt water in abundance and is probably the horizon that made oil in the **Wm. Mearns No. 1 (76) Well**, in Banks District, Upshur.

SANDS OF THE MAUCH CHUNK SERIES.

Maxton Sand.—The Maxton Sand, which is the only horizon of the Mauch Chunk that has produced oil or gas in considerable quantity, is usually a fine-grained bed coming 50 to 100 feet above the top of the Big Lime and being 10 to 50 feet thick. So far as known, it has not produced oil or gas commercially in Barbour and Upshur, but has made shows of both in several wells.

Little Lime.—The Little Lime belongs almost at the base of the Mauch Chunk Series and is separated from the Big Lime by only a few feet of shale known to the drillers as the Pencil Cave. It has made no show of oil or gas in either county, and is useful mostly as a marker for the Big Lime.

SANDS OF THE GREENBRIER LIMESTONE SERIES.

Big Lime.—The Big Lime, or Greenbrier Limestone, belonging in western Barbour and northern Upshur, about 1600 feet below the Pittsburgh Coal, is a hard, gray stratum, 50 to 200 feet thick, and usually barren of oil and gas, although it has produced shows of both at several points. It is of great value as a "key-rock" for the sands below it, as it can always be recognized and the intervals to the sands below are fairly constant over wide areas.

SANDS OF THE POCONO SANDSTONE SERIES.

Keener Sand.—The Keener Sand, coming at the top of the Pocono and usually directly underlying the Big Lime, is usually considered to be only a split off the top of the Big Injun. When distinguished from the latter sand in the well records, it is usually 25 to 30 feet thick. So far as known it has made no show of oil or gas in either Barbour or Upshur. It is seldom noted as a distinct horizon in these counties.

Big Injun Sand.—The Big Injun Sand, usually directly underlying the Big Lime but sometimes separated from it by the Keener Sand and a streak of shale, is probably the most valuable oil sand of the State. It varies from 50 to 100 feet in thickness and is usually a coarse, pebbly stratum, with an ideal structure for holding oil and gas. In Barbour and Upshur, it has exhibited shows of oil at several points and has produced gas in considerable quantity in the Craddock field of Upshur, but is generally barren. Along the synclines it sometimes holds salt water.

Squaw Sand.—The Squaw Sand, being usually 25 to 50 feet thick, and separated from the Big Injun by 10 to 50 feet of shale, is not generally productive. In Barbour it made a show of oil in the T. O. Martin No. 1 (15) Well.

Weir Sand.—The Weir Sand, which produces oil at Blue Creek, Kanawha County, appears to come below the Squaw (but may be identical with it—I. C. W.) and a short distance above the Berea and about 350 feet below the top of the Big Lime. It is usually not more than 25 to 30 feet thick and is often absent entirely. So far as known it has not made oil or gas in Barbour and Upshur.

Berea Sand.—The Berea Sand, belonging at the base of the Pocono, and 350 to 500 feet below the top of the Big Lime, is one of the most persistent oil and gas horizons of the State, and probably offers more hope of commercial oil and gas than any other sand likely to be found in Barbour and Upshur. It has produced some gas in both counties and has made creditable showings of oil in wells that could have been profitably pumped if they had been near enough to pipe-lines. The sand varies from 10 to 40 feet in thickness.

SANDS OF THE CATSKILL BEDS.

The sands of the Catskill are distinguished generally by frequent beds of red shale between the various sandy members and by a brownish-red color of the sands themselves. Most of them are lenticular, often thinning out completely in a distance of a few hundred feet. There are usually 8 to 10 different sands in the entire series, varying from 10 to 40 feet in thickness, and as they are all of the same physical appearance, it is often difficult to identify the different members with certainty in regions where a large number of well records are not available. They are usually non-water-bearing.

Gantz Sand.—The Gantz Sand, coming near the top of the Catskill and separated from the Berea Sand by only a thin bed of red or brown shale, is frequently not found at all in Barbour and Upshur, and, so far as known, has not made any showings of oil or gas, except in the **Sherman Heirs No. 2 (83) Well,** at Craddock, where it made a little oil. although in some well records the drillers have incorrectly identified the Berea with the Gantz. The Gantz belongs 400 to 550 feet below the top of the Big Lime and varies from 5 to 25 feet in thickness.

Fifty-foot Sand.—The Fifty-foot Sand, coming next below the Gantz and 450 to 600 feet below the top of the Big Lime, varies in thickness from 10 to 50 feet, and is usually found where its horizon has been pierced in the two counties. It has made shows of gas in several wells.

Thirty-foot Sand.—The Thirty-foot Sand, coming 500 to 650 feet below the top of the Big Lime, is usually found in the borings, being 10 to 30 feet in thickness. It is one of the gas-producing horizons of the Stonecoal Gas Field in Upshur and has made showings elsewhere.

Gordon Stray Sand.—The Gordon Stray Sand, belonging 600 to 700 feet below the top of the Big Lime, is usually 10 to 25 feet in thickness and like all the other Catskill sands. is lenticular in its occurrence. In the **James R. White No. 1 (52) Well,** in the Stonecoal Field, it made a show of oil.

Gordon Sand.—The Gordon Sand, which, together with the Berea, ranks after the Big Injun in the value of its oil and gas production in the State, belongs 650 to 750 feet below the top of the Big Lime, and varies in thickness from 5 to 30 feet. It is one of the gas-producing horizons of the Stonecoal and Frenchton Fields and has made some slight shows of oil.

Fourth Sand.—The Fourth Sand comes next below the Gordon and belongs 700 to 800 feet below the top of the Big Lime, being from 10 to 30 feet in thickness. It has made some gas and showings of oil at various points in both counties.

McDonald or Fifth Sand.—The McDonald or Fifth Sand, which belongs 150 to 175 feet below the top of the Gordon and 800 to 900 feet below the top of the Big Lime, is one of the great gas-producing horizons of the neighboring counties of Lewis and Harrison. Like the other Catskill Sands, it is lenticular, but when present it varies in thickness from 10 to 40 feet. It has been recorded in most of the wells that have pierced its horizon in both counties and has made some gas and a few showings of oil.

Bayard or Sixth Sand.—The Bayard or Sixth Sand comes next below the Fifth, and belongs 850 to 950 feet below the top of the Big Lime, and 175 to 225 feet below the top of the Gordon. It is very lenticular, often not being found at all, but when present is from 5 to 20 feet in thickness. It made a show of gas in the **Jacob Krise No. 1 (51) Well**, in the Stonecoal Field.

Elizabeth or Seventh Sand.—The Elizabeth or Seventh Sand, coming at the base of the Catskill, and 900 to 1000 feet below the top of the Big Lime and 250 to 300 feet below the top of the Gordon, is not usually found, and little evidence is available regarding its thickness and character beyond the fact that it is a lenticular horizon of the usual Catskill type. It has been questionably identified in a few wells, but, so far as known, has made no showings of oil or gas.

SANDS OF THE CHEMUNG AND PORTAGE BEDS.

Little definite knowledge is available regarding the sands of the Chemung and Portage Beds in Barbour and Upshur beyond the fact that several deep wells recently drilled in southern Taylor and western Barbour have found sands below the Catskill or Venango Group. These sands must necessarily belong with the deep-sand horizons of northwestern Pennsylvania and western New York, but owing to the wide intervening territory where they have seldom been found they can not be correlated with certainty. In the detailed well records published on subsequent pages, tentative identifications are suggested, based on similar intervals as found in northwestern Pennsylvania. In the **J. C. Benson No. 3612 (10) Well**, in western Barbour, some gas was obtained in what appears to be the Bradford? (Benson) Sand, coming 2855 feet below the top of the Big Lime and 4371 feet below the Pittsburgh Coal but termed the **Benson Sand** in this Report. In eastern Upshur a show of gas was found in the **J. K. P. Koon Heirs No. 1 (59) Well**, that seems to be in the Speechley Sand, coming 1715 feet below the top of the Big Lime, 3000 feet below the horizon of the Lower Kittanning Coal, and approximately 3775 feet below where the Pittsburgh Coal would belong if the hills were high enough to contain it. At Buckhannon a show of gas has been recently found in the **F. & O. Leonard No. 7151 (43A) Well** in what seems to be the Balltown Sand, coming 2349 feet below the top of the Big Lime.

SANDS OF THE LOWER DEVONIAN.

In recent years a determined effort has been made by some of the large gas companies in West Virginia and Pennsylvania to drill to the sands of the Lower Devonian and Silurian that produce oil and gas in abundance in Ohio and Indiana, and that would underlie the known productive sands of West Virginia by an interval of several thousand feet of barren sandy shales. Up to the present time only a few of the upper members of this lower group of sands have been pierced by the drill, the results being negative, owing to the fact that most of the deep wells have been drilled in regions where mountain folding has been severe enough to fracture the strata and permit the hydrocarbons to escape. In Randolph County, the **P. C. Daniels No. 1 (92) Well,** located along a great mountain anticline near Beverly and starting somewhere near the base of the Chemung Series, made some shows of oil and gas, but the detailed record is not available.

The **Alonzo W. Murphy No. 1 (91) Well**, drilled just west of Montrose along the same anticline, also made a little gas, but its detailed record is not available. The **Parsons Pulp and Lumber Company Well**, drilled at Parsons, Tucker County, approximately 20 miles eastward from Philippi, starts well down toward the base of the Chemung, and reached the Corniferous Limestone at 3825-3845 feet, finding a pocket of gas at 3830 feet. The Oriskany Sandstone was found at 3980-4060, and contained salt water but no oil or gas, the total depth of the hole being 4250 feet.

The following table gives a list of the lower productive sands of Ohio, together with their probable thickness and depth below the Big Lime in central West Virginia:

Deep Sands of Ohio	Probable Depth from Top of "Big Lime" of W. Va., Central W. Va. Feet.
Corniferous Limestone	5700
Oriskany Sandstone	5750
Helderberg, Salina, and Niagara ("Big Lime" of Ohio)	5900
Medina White Sandstone ("Clinton" Sand)	6900
Trenton Limestone	8200

WELL RECORDS AND PROSPECTIVE AREAS, BARBOUR COUNTY.

EARLY HISTORY.

Probably the first well in Barbour was the **Jesse Vannoy No. 1 (30)**, located on Sugar Creek just south of Vannoys Mill, and drilled to a depth of 600 feet, according to Hon. A. G. Dayton and others, who state that the well was originally drilled for salt water, which was secured in sufficient quantity to start a small refinery to supply local demand. Soon after the owners had begun to boil the brine a thick, greasy substance appeared in the water, evidently crude oil, that ruined the salt, and the well was abandoned. W. M. Bolton and other near-by residents state that a small gas flame can still be had from the well by inserting a pipe to a depth of a few feet through the surface mud at the top of the hole.

No further drilling has been attempted in the vicinity of the Vannoy well, but about the year 1900 or 1902 two wells were drilled at Philippi, one at Meriden, and one near Elk City on Elk Creek, all of which were deep tests. Some shows of oil and gas were secured, but the results on the whole were discouraging and drilling was abandoned for several years. Lately several wells have been drilled in the western part of the County, some of which are now producing gas.

SUMMARIZED WELL RECORDS, BARBOUR COUNTY.

The following table, compiled from the detailed records of wells in Barbour, is intended to exhibit at a glance the most important data regarding all the wells listed in the county, giving not only the serial numbers by which their positions are fixed on Map II, but also the tidal elevations, depth to the Lower Kittanning Coal, depth to the principal sands, total depth, and producing sands. The detailed records are published on subsequent pages and the index should be consulted to find the record of any particular well desired. The detailed records of several wells could not be secured, and some of these are not mentioned elsewhere in the text as this table contains all the available information. Unfortunately some of the most interesting tests in the County were drilled with little or no attempt being made to keep a record or else the records have been entirely lost or destroyed. Throughout the text all wells when mentioned are accompanied by the serial numbers in parentheses, so that their positions on Map II may be readily found. In the column naming the owner, an attempt has been made to secure the names of the present owners of the leases rather than the original drillers, in cases where the wells are being actively operated, as some of the wells have been acquired by the large gas companies from small operators and have been given serial numbers shown in the name column, which could not have been used in this Report had the original owners been named. Throughout the text the original operator is mentioned in connection with the detailed record in all cases where this information is available. In the elevation column the letter "B" following a figure indicates an elevation secured by aneroid barometer checked on

PLATE XVIII.—Brush Creek Shale and Brush Creek Coal on Whites Camp, near Rock Cave, Upshur County. The coal, about one foot thick, is below the hammer and the shale is above it. The large block of shale at the left contains marine fossils in profusion.

spirit-levels, and the letter "L" indicates a hand-level determination from a bench mark near by. All depths are expressed in feet. The following abbreviations of company names have been used in the table:

Constant	Constant Oil Company.
Elk Creek	Elk Creek Oil & Gas Company.
Greensboro	Greenboro Gas Company.
Gum Spring	Gum Spring Oil & Gas Company.
Hardin Bros	Hardin Brothers.
Hope	Hope Natural Gas Company.
Maxwell et al	Porter Maxwell and others.
O'Neal	O'Neal Oil & Gas Company.
Tri-State	Tri-State Gas Company.
T. V. Min	Tygarts Valley Mineral & Oil Company.
W. Va. Central	West Virginia Central Gas Company.

Under the producing sand column, all shows of oil and gas are listed, the following abbreviations being used for the various sands:

L. D	Little Dunkard.
B. D	Big Dunkard
Gas Ss	Gas Sand.
II Cow R	Second Cow Run.
Max	Maxton.
L. Lm	Little Lime.
B. Lm	Big Lime.
Knr	Keener.
B. I	Big Injun.
Gnz	Gantz.
50-ft	Fifty-foot.
30-ft	Thirty-foot.
Stray	Gordon Stray.
Gord	Gordon.
4th	Fourth.
5th	Fifth or McDonald.
6th	Sixth or Bayard.
7th	Seventh or Elizabeth.

Summarized Record of Tests

No. on Map.	Farm Name and Number.	Magisterial District.	Owner.	Elevation.
1	J. G. Bender (M. J. Coplin) No. 1	Simpson (Harrison)	Tri-State	1030B
2	Geo. Lancaster No. 578	Simpson (Harrison)	Hope	1365B
3	Thurman Cole No. 1	Pleasant	Constant	1135B
4	Simon Johnson No. 1	Pleasant		1185B
5	Guy Cleavenger No. 1	Pleasant		1105B
6	Fleming Coal & Coke Co. No. 1	Flemington (Taylor)		......
7	Pittsvein Coal Co. No. 1	Flemington (Taylor)		1183L
8	Samuel Dickeson (W'm. Reed) No. 1	Elk		1080B
9	Julia Hall No. 1	Elk	Elk Creek	1048L
10	J. C. Benson No. 3612	Elk	Hope	1026L
11	Ira C. Post No. 1	Elk (Harrison)	Maxwell et al.	1010B
12	Ira C. Post No. 2	Elk (Harrison)	Maxwell et al.	1075B
13	Porter Maxwell No. 3869	Elk (Harrison)	Hope	1050B
14	Taylor Ward No. 1	Union	O'Neal	1085B
15	T. O. Martin No. 1	Union	Randolph & Davis.	1160B
16	L. D. Kerr No. 1	Union	W. Va. Central	1380B
17	E. D. Talbott Heirs No. 2	Philippi	T. V. Min.	1414L
18	E. D. Talbott Heirs No. 1	Philippi	T. V. Min.	1315B
19	Hall Coal Co. No. 1	Philippi	Hall Coal Co.	1310B
20	Lucinda McDaniel Heirs No. 1	Knottsville (Taylor)	Hardin Bros.	998L
21	Absalom Knotts No. 1	Knottsville (Taylor)	Greensboro	1460B
22	Russell S. Hauser No. 1	Knottsville (Taylor)	Greensboro	1480B
23	Russell McCartney No. 1	Knottsville (Taylor)	Greensboro	1580B
24	Daniel Sinclair No. 1	Reno (Preston)	J. G. Wolf	1315B
25	Andrew Miller No. 1	Cove	Hardin Bros.	1445L
26	Hardin Bros. No. 1	Cove	Hardin Bros.	1460L
27	Alex. Summers No. 1	Cove	Gum Spring	1525L
28	Bedford Campbell No. 1	Cove		1295B
29	R. M. Nestor No. 1	Cove	Frank Anderson	1380B
30	Jesse Vannoy No. 1	Glade		1585B

In addition to the abbreviated records of the table, all available detailed logs will be given in the following pages, except such as have been used in connection with the sections of Chapter IV, to which reference will be made in their proper serial sequence. These records show, as far as could be obtained, all the sands and formations encountered, as well as coal seams, water horizons, casing, and pressure records. Some of the records are defective, lacking many important horizons that should have been noted, but some of the others are exceptionally good. In all cases an attempt has been made to give the proper correlation of the various sands, the comparative information at hand being much more complete than can be had by the driller.

for Oil and Gas in Barbour County.

Lower Kittanning Coal.		Big Lime. Top.	Big Injun Sand. Top.	Berea Sand. Top.	Gordon Sand. Top.	Fifth Sand. Top.	Total Depth.	Producing Sand and Remarks.	No. on Map.
Depth. Top.	Thickness. Feet.								
			1365				4028	Speechley (?) gas show	1
		1270	1340		2070	2855	3371	Dry hole	2
		1310	1385				1915	Salt, gas show	3
							900	Salt, gas show	4
								Salt, gas show	5
							2500	B. I. oil show	6
		1493	1575		2224		3019½	B. I. gas show	7
							400(?)	II Cow Run, gas show	8
448	5	1216	1315	1601		2089	2594	Dry hole	9
...?		1235	1325	1615	1996	2140	4570	Gas ss., B. Lm., B. I., Berea, Speechley(?), Benson, gas	10
							2200 ?	B. Lm. oil show, B. I. ? oil and gas show	11
							2200 ?	B. I. ? gas show	12
							4386		13
							2250 ?	Oil and gas show	14
610	10	1245	1300	1558	1990		2660	Squaw oil show	15
		945	1050	1275	1725	1820	2395	B. Lm. oil, B. I. oil and gas show	16
208	4	1029	1121	1376		1935	3348	Berea, oil and gas show	17
							3200 ?	Berea (?) oil and gas show	18
							1800 ?	Dry hole	19
100	4	836	970			1773	2502	Dry hole	20
		1215	1325	1650	1880		3955	Gas show, 1210′; Benson Sand, oil show, 3911′	21
392	8	1170				2030	4437	Light gas, Max	22
425	4	1285	1350				3506	Gas show, 2425′, in Warren ? ss	23
							1300 ?	Dry hole	24
							2500 ?	Berea, light gas; Gord. oil show	25
							3000 ?	Berea, gas show; Gord. oil show	26
							1600 ?	Oil show	27
								Dry hole	28
								Light oil	29
							600	Oil and gas show	30

DETAILED WELL RECORDS AND PROSPECTIVE AREAS,

PLEASANT DISTRICT, BARBOUR.

Pleasant District is situated in the northwestern corner of Barbour next to Harrison and Taylor and is traversed in its western end by the Ligonier Syncline which runs across it in a north and south direction. Viewed from a structural standpoint, the western part of the District looks favorable for oil, but the three wells drilled there found nothing in commercial quantity, and other wells in the edge of Harrison and Taylor showed nothing better. The following record is that of a well located just west of the Barbour Line. The record has been published in a former Report of the Survey[8] in connection with a geological section but its close proximity to Barbour makes it of pertinent interest here:

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[8] Ray V. Hennen, Doddridge-Harrison Report, W. Va. Geol. Survey, p. 120, 1912.

J. G. Bender (M. J. Coplin Heirs) No. 1 Well Record (1).

Simpson District, Harrison County; on Brushy Fork of Elk Creek, ½ mile southwest of Grassland; authority, Tri-State Gas Company; elevation, 1030′ B.

	Top. Feet.	Bottom. Feet.
Coal, Harlem	150	154
Coal, Brush Creek	332	334
Sandstone, Big Dunkard	355	385
Sandstone, Gas Sand of Marion	450	510
Sand, Second Cow Run and Salt (no break)	610	1240
Lime	1240	1250
Red rock and slate	1250	1265
Lime	1265	1273
Slate	1273	1283
Red rock	1283	1288
Big Lime	1288	1365
Sand, Big Injun	1365	1470
Slate and lime shells	1470	1700
Sand, Berea	1711	1724
Slate	1724	1745
Sand, Gantz and Fifty-foot	1745	1782
Slate and shells	1782	2000
Red rock	2000	2245
Sand, Fifth, broken	2247	2279
Red rock	2279	2310
Slate and shells	2310	2750
Slate, white	2750	2820
Slate and shells	2820	2950
Lime and shells (little gas in Speechley (?) Sand at top)	2950	3320
Lime, with occasional break of slate	3320	3450
Slate and shells, to bottom	3450	4028

"Changed to wire line at 2530′."

The gas at 2950 feet might be in a shell or remnant of the Speechley Sand, or possibly the Clarendon above it, as its interval from the Pittsburgh Coal would be about 3125 feet.

The following record, published in the Doddridge-Harrison Report, page 536, was a dry hole, but shows a sand at 3237 feet below the Pittsburgh Coal that Mr. Hennen has called the Speechley:

George Lancaster No. 1 Well Record (2).

Simpson District, Harrison County; on Pigtail Run, 1.8 miles northeast of Grassland; authority, Hope Natural Gas Co.; elevation, 1365′ B.

	Top. Feet.	Bottom. Feet.
Coal, Pittsburgh	42	48
Sand, Dunkard	568	600
Gas Sand of Marion	675	710
Sand, Maxton	1030	1090
Big Lime?	1270	1340
Sand, Big Injun?	1340	1480
Sand, Squaw?	1778	1820
Sand, Fifty-foot	2020	2045
Sand, Thirty-foot	2070	2085
Sand, Fourth	2355	2375
Lime and shells	2500	3000
Lime, sand, and shells	3000	3280
Sand, (salt water at 3295′), Speechley?	3285	3310
Black slate	3310	3320
Hard lime	3320	3340
Black slate	3340	3371

10″ casing, 270′; 8¼″ casing, 1400′. Dry hole.

The driller has evidently made a mistake in identifying the Big Lime and Big Injun, as the Big Lime in this region belongs 1450 to 1500 feet below the Pittsburgh Coal.

The following well, the record of which was furnished the Survey by Mr. Perry Thompson, of Fairmont, West Virginia, and was formerly published by Dr. White in Volume I(a), page 348, was located only a short distance west of the Ligonier Syncline, but showed no oil. The hole starts about 125 feet below the Pittsburgh Coal:

Thurman Cole No. 1 Well Record (3).

Pleasant District; on West Branch of Simpson Creek, 2.1 miles north of Pepper; authority, Constant Oil Company; elevation, 1135′ B.

	Top. Feet.	Bottom. Feet.
Sand, Big Dunkard	400	490
Sand, Salt	1000	1050
Limestone shells and unrecorded	1050	1250
Sand, Maxton	1250	1310
Big Lime	1310	1385
Sand, Big Injun	1385	1505
Sand, Berea	1800	1810
Slate and shells	1810	1850
Sand, Fifty-foot, to bottom	1850	1915

The above well was reported to have made a show of gas from the Salt Sand, but as this formation is not named in the record, the report may be taken as somewhat doubtful.

The **Simon Johnson No. 1 (4) Well,** drilled by unknown parties on West Branch of Simpson Creek, 2 miles north of Pepper and just south of the Cole well, was abandoned as a dry hole. It was completed about 1907 or 1908, and is reported to have been drilled about 900 feet deep and to have made a show of gas in the Salt Sand.

The **Guy Cleavenger No. 1 (5) Well,** drilled by unknown parties, on West Branch of Simpson Creek, 2.2 miles north of Pepper, and only a short distance east of the Cole and Johnson wells, and completed at about the same time as the Johnson well, was reported to have been drilled about 900 feet deep and to have made a show of gas in the Salt Sand.

The **Fleming Coal and Coke Company No. 1 (6) Well,** drilled by unknown parties, on Simpson Creek, one mile south of Flemington, Flemington District, Taylor, was completed in 1899, and made a show of oil in the Big Injun Sand but was abandoned as a dry hole. Its total depth is reported as 2500 feet.

The following well, drilled about 2½ miles north of the Barbour Line, was formerly published by Dr. White in Volume I(a), page 340, of the Survey, under the name of Flemington Coal Company, the former owners. The record is much more detailed than any other along this part of Barbour and is here republished in full. It starts 22 feet below the Pittsburgh Coal:

Pittsvein Coal Company No. 1 Well Record (7).

Flemington District, Taylor County; on a branch of Simpson Creek, 0.7 mile northeast of Flemington Station; authority, Pittsvein Coal Company; elevation, 1183' L.

	Thickness. Feet.	Total. Feet.
Conductor	13	13
Sand	15	28
Slate	25	53
Limestone	20	73
Red rock	59	132
Limestone	15	147
Slate, light	20	167

	Thickness. Feet.	Total. Feet.
Limestone	20	187
Red rock	30	217
Limestone (cased, 13")	20	237
Limestone	10	247
Sand, white	40	287
Slate, black	13	300
Coal, Harlem	8	308
Slate, white	5	313
Limestone	7	320
Slate, white	16	336
Limestone	10	346
Slate, white	20	366
Sand	25	391
Slate, black	10	401
Red rock	35	436
Slate, white	30	466
Limestone	6	472
Slate, pink	52	524
Slate, white	18	542
Sand, white, Big Dunkard	62	604
Limestone	15	619
Slate	35	654
Limestone	50	704
Sand	41	745
Limestone	6	751
Sand, white	24	775
Sand, black	30	805
Sand, white, Second Cow Run	35	840
Slate, black	10	850
Sand, white, Salt	30	880
Slate	30	910
Sand	72	982
Slate, white (cased, 10")	12	994
Sand, white	79	1073
Slate, black	50	1123
Limestone, black	12	1135
Sand, white, Salt Sand of Rosedale	23	1158
Slate	6	1164
Red rock	141	1305
Limestone, sandy	24	1329
Red rock	128	1457
Limestone	6	1463
Red rock	10	1473
Limestone	10	1483
Slate	10	1493
Limestone, Big Lime	82	1575
Sand, Big Injun (gas)	40	1615
Red rock	10	1625
Sand	30	1655
Red rock	15	1670
Sand, Squaw	40	1710
Slate and shells	60	1770
Sand, broken and shelly, Weir and Berea	100	1870
Slate and shells	110	1980
Sand, Fifty-foot	115	2095

	Thickness. Feet.	Total. Feet.
Slate	10	2105
Sand	20	2125
Red rock	15	2140
Sand, Thirty-foot	30	2170
Red rock	54	2224
Sand, Gordon	6	2230
Red rock and shells	150	2380
Slate and shells	55	2435
Sand, Bayard	25	2460
Slate	15	2475
Sand, Elizabeth, and limestone	25	2500
Red rock and shells	50	2550
Limestone and sand	20	2570
Slate and shells to bottom	449½	3019½

The show of oil in well No. 6 and the show of gas in No. 7 assume a new significance in view of a well recently completed on the Scrannage farm in Booths Creek District, Taylor, a short distance southeast of McGee, 5 or 6 miles northeast of the Pittsvein well and along the same syncline. This well has been flowing several barrels of oil daily from the Big Injun Sand, the gravity of which is reported as 56° Baume.

Prospective Oil and Gas Areas, Pleasant District.—That portion of Pleasant District west of the Ligonier Syncline seems to have been tested sufficiently to show that it is not likely to contain oil and gas in quantity, but the central and eastern parts of the District have had no tests and offer some hope of production. The following territory is suggested: (1) The head of Pleasant Creek and that portion of Simpson Creek lying between the Ligonier Syncline and Berryburg might hold a pool of Big Injun oil, as some oil was found in the M. Rector No. 1 Well, located on Berkeley Run, 1.5 miles north of Webster, Court House District, Taylor County, as published in a former Report[4]. No intervening tests have been drilled on this side of the syncline between the Rector well and Simpson Creek. (2) That portion of the District lying along the axis of the Hiram Anticline east of Clemtown would be a favorable locality to test for gas in the Big Injun,

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[4] Ray V. Hennen, Monongalia-Marion-Taylor Report, W. Va. Geol. Survey, p. 635; 1913.

Berea, and Fifth Sands, although other wells drilled farther north in Taylor County are somewhat discouraging.

DETAILED WELL RECORDS, ELK DISTRICT, BARBOUR.

Elk District lies south of Pleasant and next to the Harrison Line and is traversed by the Ruraldale Anticline and Ligonier Syncline, while the Grassland Syncline is only a short distance west of the District Line. In the eastern end, the structure rises rapidly toward the Hiram Anticline. Only two deep wells have been drilled in the District, one of which is a gasser and the other a dry hole.

The **Samuel Dickeson (Wm. Reed) No. 1 (8) Well,** drilled about 50 years ago by the springpole method in the hope of finding salt water, and located along Elk Creek, 0.3 mile west of Elk City, is reported to have reached a depth of only 400 feet, and found a show of gas, probably in the Second Cow Run Sand. Its shallow depth makes it inconclusive as a test of the lower sands.

The following record is that of a well located farther west along Elk Creek. The record was carefully kept for Mr. C. McC. Lemley, Assistant Engineer of the Baltimore and Ohio Railroad Company, who furnished it to the Survey, and has been published in a previous Report[5]. According to Mr. Lemley, the well starts 310 feet below the Pittsburgh Coal. Some slight corrections and additional names are added to the record:

Julia Hall No. 1 Well Record (9).

Elk District; on Elk Creek, 1.5 miles northwest of Elk City; authority, Elk Creek Oil and Gas Company; completed in 1902; elevation, 1048′ L.

	Thickness. Feet.	Total. Feet.
Soft sand (surface)	14	14
Coal, Harlem	6	20
Lime, black	15	35
Lime shell	20	55
Lime, red and black	20	75
Red rock and slate	15	90
Light slate and lime	10	100

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[5] I. C. White, Vol. I(a), W. Va. Geol. Survey, p. 346; 1904

	Thickness. Feet.	Total. Feet.
Sand, Moundsville	25	125
Red rock and shell	13	138
Slate, black	62	200
Lime, blue	75	275
Sand, white 5′ Sand, black 10 } Big Dunkard	15	290
Coal, Upper Freeport	5	295
Sand, black 15′ Sand, white 10 } Burning Springs	25	320
Lime, black	15	335
Lime, black, sandy	55	390
Sand	10	400
Coal, Upper Kittanning	3	403
Lime and sand	15	418
Slate, white	30	448
Slate, black, Lower Kittanning Coal horizon	5	453
Slate, white	5	458
Sand, white, Homewood, Second Cow Run	52	510
Slate, white	25	535
Lime, white	10	545
Coal, Upper Mercer	5	550
Sand, black	15	565
Coal, Lower Mercer	5	570
Sand, white, pebbly at base, Upper Connoquenessing Sandstone, Salt Sand	56	626
Shale, brown	24	650
Coal, Quakertown	2	652
Slate, white	18	670
Coal, Campbell Creek?	2	672
Slate, white	13	685
Sand, dark, Salt	40	725
Slate, black	35	760
Coal, Eagle?	3	763
Shale, brown	23	786
Lime, black	20	806
Sand, white, Gas Sand of Rosedale	25	831
Slate, black	10	841
Sand, white, Salt Sand of Rosedale	55	896
Slate, black	30	926
Lime, white	5	931
Slate, black	10	941
Red rock and lime	10	951
Lime, white	40	991
Red rock and lime	50	1041
Sand, pebbly 86′ Sand, gray 44 } Maxton	130	1171
Sand and lime	10	1181
Red rock	15	1196
Slate, black	20	1216

		Thickness. Feet.	Total. Feet.
Lime 35′	Big Lime	99	1315
Lime, white 6			
Lime and slate 5			
Lime, black 53			
Sand and lime 10′	Big Injun	111	1426
Lime, white 15			
Sand, white 36			
Red rock and sand 10			
Lime and sand 40			
Lime, black		20	1446
Lime, sand		25	1471
Slate, white		40	1511
Lime and sand shale		20	1531
Slate		5	1536
Sand, Weir, and lime		50	1586
Slate		15	1601
Sand, Berea		30	1631
Lime, black		25	1656
Sand, white, Fifty-foot		65	1721
Slate, black		9	1730
Sand, Thirty-foot		20	1750
Lime, black		49	1799
Slate		80	1879
Red rock		99	1978
Lime		11	1989
Chocolate (red) shale		100	2089
Sand, white, Fifth		25	2114
Slate, black		55	2169
Sand, hard, Bayard		25	2194
Slate, lime, and shale, to bottom		400	2594

The record as given above shows no trace of oil or gas. According to Hon. A. G. Dayton, of Philippi, one of the interested parties, a large flow of water was found in the Berea Sand.

The **J. C. Benson No. 3612 (10) Well,** located at Overfield, on Elk Creek, and drilled by the Hope Natural Gas Company, the record of which is published in full in connection with the section for Overfield, page 85, was begun October 28, 1914, and finished during the summer of 1915. The well was a deep test, 4570 feet in all, and is now a producing well. Gas was found in the Gas Sand of Marion, Big Lime, Big Injun, Berea, and in the Clarendon? or Speechley? at 2879′, and in the Benson (Bradford?) Sand, at 4090′. The well starts 281 feet, by hand-level, below the Pittsburgh Coal, making the gas at 2879 feet come at an interval of 3160 feet below the coal. In the **J. G. Bender (M. J. Coplin) No. 1 Well (1),** the record of which has been previously given, gas was found at a depth of 2950 feet, or at an interval of 3125 feet below the Pittsburgh Coal, which corresponds very closely to that found in the Benson well, making it seem evident that the same deep horizon was productive in both wells. The gas found in the Benson (Bradford?) Sand at 4090 feet is reported to have been a considerable amount and is probably at the greatest depth below the surface of any gas yet found in West Virginia, although the gas in the Corniferous Limestone in the Parsons deep well is at a lower stratigraphic level.

It is regrettable that the Benson well was not carried on down to the Corniferous Limestone and the Oriskany Sand just below it, as these should have been found at slightly more than 7000 feet.

Water was found in the Benson well at 570 feet, at 660 feet in one of the Salt Sands, at 1430 feet in the Big Injun, at 1672 feet in the Berea, and in unrecorded material at 2535 feet.

Three wells have been drilled along Gnatty Creek, in Elk District, Harrison, near the Barbour Line. The **Ira C. Post No. 1 (11) Well,** located 2.4 miles northwest of Peeltree, and drilled by a local company composed of Porter Maxwell, Ira Post, Thompson, and others, is reported to have reached a total depth of 2200 to 2250 feet. It made a show of black oil, reported at 3 barrels, from the Big Lime, and gas, thought to be from the Big Injun Sand, some of the oil still flowing from the well mouth. The **Ira C. Post No. 2 (12) Well,** drilled by the same parties, and located 2 miles northwest of Peeltree, is reported to have been drilled to about the same depth as the first well. Some gas was found, thought to have been from the Big Injun Sand and also from a lower sand, 2 families having been supplied for about two years, after which the gas declined rapidly.

The third well on Gnatty Creek has not yet been completed, but is being made a deep test, of which the following is an abbreviated record:

Porter Maxwell No. 3869 Well Record (13).

Elk District, Harrison County; on a branch of Gnatty Creek, 1.9 miles west of Peeltree; authority, Hope Natural Gas Co.; elevation, 1050′ B.

	Top Feet.
Sand, Gas Sand of Marion	546
Big Lime	1531
Sand, Big Injun	1621
Sand, Fourth	2279
Sand, Bayard	2436
Total depth	4386

Prospective Oil and Gas Areas, Elk District.—The following additional drilling is suggested for Elk District: (1), The northwestern part lying along the axis of the Ruraldale Anticline, north of Overfield, might have some Big Injun or Berea Sand gas, as the structure rises to a slight dome at the Harrison County Line, making it possible that the water found in conjunction with the gas in these two sands at Overfield might be avoided and a heavier flow of gas secured. If the gas found in the Benson (Bradford?) Sand at Overfield should prove lasting, the chances for it along the anticline toward the north would be equally as good. (2), The northeastern part of the District, between Pepper and Berryburg, is far removed from any tests, and would offer some hope of finding oil or gas at the foot of the steep structural slope near the headwaters of Stewart Run. The hazard of drilling here would be much greater, however, than in the first area outlined above.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS, UNION DISTRICT, BARBOUR.

Union District lies in the western part of the county next to Harrison and Upshur, and is traversed in its western portion by the Ruraldale Anticline and the Ligonier Syncline, and at its eastern end the structure is rising rapidly toward the Hiram Anticline, making conditions much the same as in Elk District. Three wells have been drilled, none of which has produced oil or gas in commercial quantity.

The **Taylor Ward No. 1 (14) Well,** located on Peeltree

Run of Gnatty Creek, 0.6 mile northeast of Peeltree, and drilled by the O'Neal Oil and Gas Company, was reported to have reached a depth of 2250 feet and to have made a show of oil and gas, but its detailed record could not be secured.

The **T. O. Martin No. 1 (15) Well,** located on Left Branch of Gnatty Creek, 1.9 miles northeast of Century, was drilled by Randolph and Davis, and its record, as furnished the Survey by Cleo. Swecker, civil engineer, of Century, has been used in the section for Century, page 92. The well was drilled to a total depth of 2660 feet, a show of oil having been found in the Squaw Sand, and enough gas to supply one family being reported from an unknown horizon. The well was abandoned as a dry hole.

The following record, kept with special care for the Survey by W. A. Williams, Superintendent of the West Virginia Central Gas Company, at Weston, West Virginia, shows in detail the underground rock structure in eastern Union. The well was abandoned as a dry hole. It starts near the horizon of the Lower Kittanning Coal, which belongs in the interval of surface gravel and clay at the top of the record:

L. D. Kerr No. 1 Well Record (16).

Union District; on Tygart Valley River, 0.4 mile southwest of Boulder; authority, W. Va. Central Gas Co.; completed, December 23, 1914; elevation, 1380′ B.

	Thickness. Feet.	Total. Feet.
Gravel, clay, and sand	137	137
Coal, Upper Mercer	5	142
Sand, Upper Connoquenessing, Salt	98	240
Slate	5	245
Sand, Salt	15	260
Lime	30	290
Sand, Salt	25	315
Lime,	35	350
Sand, Salt (4 bailers of water per hour)	100	450
Lime	50	500
Slate	15	515
Lime	35	550
Sand, Salt Sand of Rosedale	60	610
Red rock	25	635
Sand	120	755
Red rock	125	880
Slate and shell	55	935
Red rock	10	945
Big Lime (show of black oil)	105	1050

	Thickness. Feet.	Total. Feet.
Big Injun Sand (oil, gas, and salt water)	115	1165
Slate	10	1175
Lime	40	1215
Sand, Squaw	20	1235
Slate	40	1275
Sand, Berea	95	1370
Red rock	255	1625
Sand shells	45	1670
Lime and sand shells	45	1715
Slate, white	10	1725
Sand, Gordon	25	1750
Red rock	30	1780
Sand, Fourth	8	1788
Red rock	12	1800
Lime shells	20	1820
Sand, Fifth	10	1830
White slate	8	1838
Sand	12	1850
White slate	65	1915
Sand, (poor, lime shells), Bayard	15	1930
Slate	10	1940
Sand, Elizabeth	20	1960
Slate and shells	40	2000
White slate	350	2350
Slate and lime shells to bottom	45	2395

"Conductor, 20'; 10" casing, 265'; 8¼" casing, 718'; 6⅝" casing, 1091'. Bottom of Injun, 1110-1165', was dark, hard lime; small increase in gas, 1136-1140'. When gas was first struck, showed about 200,000 cu. ft., but blew down rapidly and was practically exhausted before the well was completed. When oil was struck, showed for 5 barrels per day in Injun; entirely exhausted before well was completed. Shot oil and gas sand with 30 quarts, but was not improved. Hole full of water at 28 feet."

The above well although a deep test did not quite reach the Clarendon? or Speechley? Sand that showed gas in the northwestern part of the County as an allowance for the southward thickening of the Pottsville would probably place this sand at 2500 to 2600 feet below the surface at the point where this well was drilled. The Benson (Bradford?) Sand, in which deep gas was found in the Benson well at Overfield, would lie at about 3800 feet below the surface at the Kerr well.

Prospective Oil and Gas Areas, Union District.—The tests already drilled in Union do not make a favorable showing for oil and gas, but they are not sufficient to be conclusive and the following areas are suggested: (1), That portion of the western end of the District north of Century and between the Ligonier Syncline and the **T. O. Martin No. 1 (15) Well** might hold a small pool of oil in the Squaw Sand, as a 5-barrel show was found in the latter well and no water recorded making the next logical location west of the Martin well, down the structural slope; (2), The presence of oil, gas, and salt water in the Big Injun Sand in the Kerr No. 1 (16) Well at Boulder indicates that a test farther east up the slope toward the Hiram Anticline might find more gas or oil, and less water, and the neighborhood of Audra or Middle Fork is suggested for a possible location.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS, PHILIPPI DISTRICT, BARBOUR.

Philippi District occupies the central portion of the County and is traversed along its eastern edge by the Hiram Anticline which has an approximate north and south direction. In the central and western part of the District, the structure is dipping rapidly, approximately 170 feet to the mile, westward toward the Ligonier Syncline. This steep dip is very uniform without terraces or breaks worthy of notice, making it questionable whether oil or gas can ever be found under such conditions. Three wells have been drilled, all in the neighborhood of Philippi, and all have been commercial failures although shows of oil and gas have been found.

The **E. D. Talbott Heirs No. 2 (17) Well** was located on a branch of Shooks Run, one-half mile west of Philippi, and drilled by the Tygarts Valley Mineral and Oil Company. Its record has been published in a previous Report of the Survey[6], and it has been used in the present Report, page 97, in connection with the Philippi Section. A show of oil and gas was found in the Berea Sand at 1376-1420 feet, and a large amount of water, apparently sulphurous but not salty. The well was drilled about 1902 and in 1916 was still flowing a stream of sulphur water, about one inch in diameter, from the casinghead. Sufficient gas came from the opening to make a flame 6 inches high.

The **E. D. Talbott Heirs No. 1 (18) Well** was located on the west side of the Tygart Valley River at Philippi, and drilled by the same company as the Talbott No. 2, being less than one-half mile northeast of the latter well. Its detailed record has not been obtained, but according to Hon. A. G. Dayton, of Philippi, who was interested in it, the well was drilled to a depth of 3200 feet, and a show of oil and gas was found in a sand that was probably the Berea, the same as in the Talbott No. 2 well. It was abandoned as a dry hole.

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[6] I. C. White, Vol. I(a), W. Va. Geol. Survey, p. 344; 1904.

The **Hall Coal Company No. 1 (19) Well,** drilled at Meriden on property now owned by the Lee J. Sandridge Coal Company, and financed largely by Philippi parties who composed the coal company, was abandoned as a dry hole. According to Judge Dayton, the well was 1700 to 1800 feet deep and made fresh water, probably from the Berea Sand which made the same showing in the two Philippi wells.

Prospective Oil and Gas Areas, Philippi District.—The presence of so much water in the wells at Philippi would indicate that there would be little hope of obtaining oil or gas in commercial quantity along this same structural level, but the oil and gas shows found in conjunction with the water would indicate that a greater amount might be found farther east and higher up toward the Hiram Anticline. There is a slight dome along the axis of the anticline 2 miles northwest of Calhoun and it would seem best to drill along the west side of the anticline between this dome and the Olive Hill School so as to tap the gas from which the showings in the Philippi wells may come. If gas should be found in encouraging quantity in this region, then drilling would logically be continued by moving westward one location at a time toward Philippi in the possible hope of finding oil. If gas should be found in the locality mentioned, it would also seem advisable to continue drilling farther south along the anticline toward the Tygart Valley River.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS, COVE DISTRICT, BARBOUR.

Cove District is in the northern part of Barbour, east of Pleasant and Philippi Districts, and next to the Taylor and Preston County Lines. It is traversed by the Hiram and Marquess Anticlines and by the Evansville and Belington Synclines, and at its eastern edge the rocks rise at a rapid rate, nearly 1000 feet to the mile toward the great anticline east of the Laurel Ridge, bringing the oil sands above the surface. Five wells have been drilled in the District, and a number of others just north of it in Taylor and Preston, none of which has produced oil and gas commercially although creditable showings have been made in some of them.

The following well, the record of which has been published in a former Report of the Survey[7], was drilled along the Tygart Valley River about two miles north of the Barbour Line. The well made no oil or gas but had a large amount of water in the Big Lime and in some of the lower sands. The record was furnished the Survey by E. H. Bennett, of Stonehouse:

Lucinda McDaniel Heirs No. 1 Well Record (20).

Knottsville District, Taylor County; on Tygart Valley River, at Stonehouse; authority, Hardin Brothers; elevation, 998' L.

	Top. Feet.	Bottom. Feet.
Coal, Lower Kittanning	100	104
Sand, Second Cow Run	210	250
Sand, Salt, Upper Connoquenessing	260	320
Slate	320	417
Coal, Eagle?	417	421
Slate	421	500
Sand, Gas Sand of Rosedale	500	550
Sand, Salt Sand of Rosedale, Sharon Conglomerate	570	585
Red rock	585	640
Lime	815	
Big Lime (big water, 880')	836	970
Sand, Big Injun	970	1100
Sand, Berea	1300	1350

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[7] Ray V. Hennen, Monongalia-Marion-Taylor Report, W. Va. Geol. Survey, p. 156; 1913.

	Top. Feet.	Bottom. Feet.
Slate (water, 1370')	1350	1370
Sand, Fifty-foot	1370	1500
Sand, Thirty-foot	1500	1540
Sand, Gordon Stray	1540	1590
Lime	1590	1610
Red rock	1610	1773
Sand, Fifth	1773	1785
Slate, shells, and unrecorded	1785	1950
Sand, Elizabeth	1950	2000
Slate, shells, and unrecorded, to bottom	2000	2502

10" casing, 157'; 8" casing, 600'; 6" casing, 1100'.

Three very interesting deep tests have been drilled recently by the Greensboro Gas Company, of Pittsburgh, Pennsylvania, in Knottsville District, Taylor, only a short distance north of the Barbour Line. Their records, as furnished by the company, are complete in every detail and should be of great interest to prospective operators in northern Barbour.

The following well starts about 300 feet below the level of the Pittsburgh Coal, and was abandoned as a dry hole, but some gas was bubbling from it in 1915 along with the water:

Absalom Knotts No. 1 Well Record (21).

Knottsville District, Taylor County; on Swamp Run, 0.5 mile west of Millertown; authority, Greensboro Gas Company; commenced, December 16, 1914; completed, March 2, 1915; elevation, 1460' B.

	Thickness. Feet.	Total. Feet.
Clay	17	17
Lime, red	138	155
Sand, white, Little Dunkard	39	194
Slate	41	235
Sand, Big Dunkard	80	315
Slate	25	340
Sand, Burning Springs	25	365
Lime	115	480
Sand, Gas Sand of Marion	15	495
Slate	60	555
Sand, Second Cow Run, Homewood	10	565
Slate	10	575
Sand, Salt, Upper Connoquenessing	45	720
Lime	45	765
Sand, Salt	25	790
Slate and shells	70	860
Lime	40	900
Red rock	60	960
Lime	50	1010

	Thickness. Feet.	Total. Feet.
Sand	85	1095
Slate and shells	10	1105
Lime	20	1125
Slate	30	1155
Sand, Maxton	25	1180
Slate (little gas, 1210')	35	1215
Big Lime	110	1325
Sand, Big Injun	125	1450
Slate	10	1460
Sand, Squaw	50	1510
Slate	25	1535
Sand, Weir	55	1590
Slate	60	1650
Sand, Berea	20	1670
Slate	20	1690
Sand, Fifty-foot	40	1730
Slate	15	1745
Sand, Thirty-foot	47	1792
Slate	38	1830
Sand, Gordon Stray	40	1870
Slate	10	1880
Sand, red, Gordon	15	1895
Slate	70	1965
Red rock	15	1980
Slate and shells	35	2015
Red rock	59	2074
Lime	146	2220
Sand, red, Bayard	30	2250
Red rock	10	2260
Sand, Elizabeth	25	2285
Slate, white	15	2300
Sand, white, Warren First?	35	2335
Red rock	30	2365
Lime	15	2380
Slate and shells	690	3070
Sand, Speechley?	25	3095
Slate and shells	305	3400
Lime	40	3440
Sand, dark	10	3450
Slate and lime	125	3575
Slate	50	3625
Lime	135	3760
Slate	20	3780
Lime, gritty	50	3830
Slate and shells	80	3910
Sand, Benson (Bradford?) (oil show, 3911')	26	3936
Slate, white, to bottom	19	3955

The oil show found in the Benson (Bradford?) Sand seems to be at the same horizon as the deep gas found in the J. C. Benson Well (10) in Barbour, as its approximate interval from the Pittsburgh Coal is 4210 feet, while that at the Benson well is 4371 feet, a discrepancy that is very small compared to the total interval.

The following well made enough gas from the Maxton Sand to supply one family, but otherwise records no production. It starts approximately 390 feet below the level of the Pittsburgh Coal:

Russell S. Hauser No. 1 Well Record (22).

Knottsville District, Taylor County; on Glade Run, 1.3 miles northeast of Knottsville; authority, Greensboro Gas Company; commenced, March 20, 1915; completed, June 29, 1915; elevation, 1480′ B.

	Thickness. Feet.	Total. Feet.
Unrecorded	55	55
Sand, Little Dunkard	85	140
Slate and shells	20	160
Sand, Big Dunkard	80	240
Slate and shells	15	255
Sand, Burning Springs	25	280
Slate	40	320
Sand, Gas Sand of Marion	65	385
Slate	7	392
Coal, Lower Kittanning	8	400
Slate and shells	80	480
Sand, Salt, Upper Connoquenessing	150	630
Slate and shells	20	650
Sand, Gas Sand of Rosedale	20	670
Slate and shells	85	755
Sand, Salt Sand of Rosedale	60	815
Red rock	85	900
Lime	20	920
Red rock	30	950
Lime	40	990
Lime shells	40	1030
Sand ....80′ Slate and shells (little gas)..60 } Maxton	140	1170
Big Lime	130	1300
Slate and shells	100	1400
Slate	50	1450
Slate and shells	240	1690
Sand, Fifty-foot	115	1805
Slate	65	1870
Slate, red	160	2030
Sand, Fifth	15	2045
Slate	60	2105
Sand, Bayard	8	2113
Red rock	87	2200
Lime, gritty	85	2285
Slate, brown	5	2290
Sand, Warren First?	30	2320

	Thickness. Feet.	Total. Feet.
Slate, brown	70	2390
Sand, Warren Second?	20	2410
Slate, pink	12	2422
Slate and shells	502	2924
Sand, Speechley (steel-line measurement)	20	2944
Slate and shells	556	3500
Slate	50	3550
Slate and shells	250	3800
Pink rock	40	3840
Slate and shells	55	3895
Pink rock	15	3910
Slate and shells	198	4108
Sand, Benson (Bradford?)	54	4162
Broken formation	258	4420
Slate, black, to bottom, Genesee	17	4437

10" casing, 190'; 8" casing, 905'; 6" casing, 2106'.

The Benson Sand is at an approximate interval of 4498 feet below the Pittsburgh Coal, as compared to 4210 feet in the Knotts well, but is probably the same horizon.

The following well was abandoned as a dry hole although it made a little gas at 2425 feet, probably in the Warren Group of sands. The well starts at an approximate interval of 335 feet below the Pittsburgh Coal horizon:

Russell McCartney No. 1 Well Record (23).

Knottsville District, Taylor County; on Glade Run, 1.8 miles northeast of Knottsville; authority, Greensboro Gas Company; completed in 1915; elevation, 1580' B.

	Top. Feet.	Bottom. Feet.
Sand, Moundsville	70	110
Sand, Little Dunkard	140	215
Sand, Big Dunkard	240	300
Slate	300	345
Sand, Gas Sand of Marion	345	425
Coal, Lower Kittanning	425	429
Slate	560	710
Coal, Sharon, Sewell	710	713
Red rock	745	800
Sand	800	870
Sand	870	900
Sand	1005	1040
Red rock	1045	1055
Lime	1055	1090
Sand, Maxton	1090	1150
Big Lime	1235	1350
Sand, Big Injun	1350	1430
Sand, Weir and Berea	1500	1590

	Top. Feet.	Bottom. Feet.
Lime	1600	1670
Sand, Fifty-foot	1740	1785
Sand, Thirty-foot	1805	1860
Lime	1890	1920
Red rock	1920	1932
Sand, Elizabeth	2265	2275
Sand, Warren First?	2335	2370
Lime	2390	2425
Lime and slate (little gas at 2425' in Warren? Sand)	2425	3506

The **Daniel Sinclair No. 1 (24) Well,** located in Reno District, Preston County, 0.6 mile northwest of Dent, was reported to have been drilled by J. G. Wolf, of Sistersville, to a depth of about 1300 feet, making it a test of the Big Injun but not of the Berea and other lower sands. So far as known, no oil or gas was found.

The **Andrew Miller No. 1 (25) Well,** drilled by Hardin Brothers, on Big Cove Run, 1.4 miles southeast of Cove Run Station, was a light gasser, not of commercial size. It starts at an approximate interval of 320 feet above the Lower Kittanning Coal, and, according to G. D. Hardin, of Kasson, West Virginia, one of the promoters, gas was found in the Berea Sand at 1500 feet, the sand being 67 feet thick and having an abundance of salt water at the top. Some oil was found in the Gordon at 1800 feet, the sand being 50 feet thick.

The **Hardin Brothers No. 1 (26) Well,** drilled by Hardin Brothers, was located 1.3 miles farther up Big Cove Run and 1.3 miles northwest of Danville. The well starts at an approximate interval of 340 feet above the Lower Kittanning Coal, and, according to Mr. Hardin, some gas was found in the Berea, and a little oil in the Gordon. The well was drilled to a total depth of 3000 feet, no sand being found below 2200 feet, the remaining interval to the bottom being occupied by red shale. An abundance of salt water was found in this well, and probably came from the Berea Sand where it was found in the Miller well. Both wells were located at a low structural level compared to the rocks farther south which doubtless accounts for the large amount of water.

The **Alexander Summers No. 1 (27) Well** was located on a short branch of the Tygart Valley River, 1.2 miles north-

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east of [illegible] Station and drilled by the [illegible] [illegible] Gas Company. According to **Mr. Summers**, [illegible] Georgia, the well was drilled to a depth of about 1,800 [illegible] made a show of oil in "several sands," the oil being [illegible] account of improper casing.

The **Bedford Campbell No. 1 (38) Well** was located [illegible] Teter Creek, 1.5 miles north of Nestorville, and drilled by unknown parties. It starts 40 feet [illegible] sand-level [illegible] opening in the Upper Freeport Coal, and so far as [illegible] was a dry hole.

The **R. M. Nestor No. 1 (39) Well** was located [illegible] Creek, one-half mile northwest of Nestorville, and only three-fourths mile west of the Belington Syncline. The [illegible] of the Company that drilled it was not learned, but according to Mr. Nestor the lease was originally taken by Frank [illegible]son, address unknown. The well starts about 130 feet [illegible] the Lower Kittanning Coal, and is reported to have [illegible] a little oil just after it was drilled, but detailed information lacking.

Prospective Oil and Gas Areas, Cove District.—The [illegible]ence of water in the Berea Sand in the wells along Big [illegible] Run, one of which was drilled at the southern end [illegible] Evansville Syncline, and the other along the Belington [illegible]cline, would indicate that drilling in this region of low [illegible]tural relief would be somewhat hazardous. Some of the [illegible] structural levels would seem more hopeful and the [illegible] are suggested: (1). The northwest corner of the Dis[illegible] along the Hiram Anticline, between Hiram and the [illegible] Valley River, might hold gas in the Berea or Gordon S[illegible] (2). The southwestern corner of the District, south [illegible] 1400-foot structure contour would seem to be at a high en[illegible] level to avoid water in the Berea Sand, and might [illegible] gas in this sand, shows of which have been found at se[illegible] wells on both sides of the anticline; (3). The showing [illegible] reported in the Nestor (39) Well near Nestorville would [illegible]cate that additional oil might be found along the Belin[illegible] Syncline, as the structure here is at a higher level than [illegible] [illegible] Run where water and oil were found in the Hardin (3[illegible]

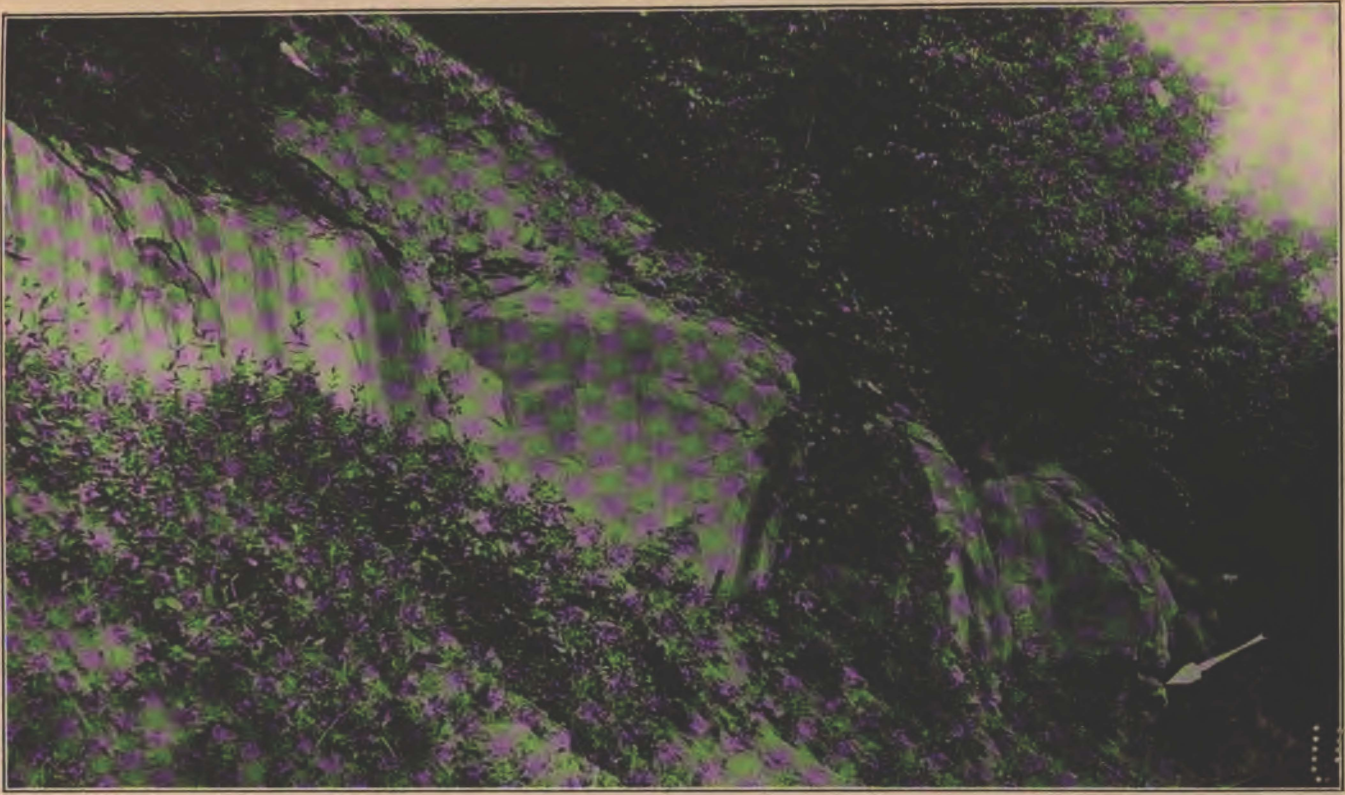


PLATE XIX.—Upper Kittanning Coal and Johnstown Cement Limestone along B. & O. R. R. just north of Meriden, Barbour County. The coal is visible at the right of the man at the upper left corner and the limestone at the end of the arrow point in the opposite corner. Heavy ledge between is sandstone.

east of Moatsville Station, and drilled by the Gum Spring Oil and Gas Company. According to Mr. Summers, of Atlanta, Georgia, the well was drilled to a depth of about 1600 feet and made a show of oil in "several sands", the oil being lost on account of improper casing.

The **Bedford Campbell No. 1 (28) Well** was located on Teter Creek, 1.5 miles north or Nestorville, and drilled by unknown parties. It starts 82 feet by hand-level below an opening in the Upper Freeport Coal, and, so far as known, was a dry hole.

The **R. M. Nestor No. 1 (29) Well** was located on Teter Creek, one-half mile northwest of Nestorville, and only about three-fourths mile west of the Belington Syncline. The name of the Company that drilled it was not learned, but according to Mr. Nestor the lease was originally taken by Frank Anderson, address unknown. The well starts about 130 feet above the Lower Kittanning Coal, and is reported to have pumped a little oil just after it was drilled, but detailed information is lacking.

Prospective Oil and Gas Areas, Cove District.—The presence of water in the Berea Sand in the wells along Big Cove Run, one of which was drilled at the southern end of the Evansville Syncline, and the other along the Belington Syncline, would indicate that drilling in this region of low structural relief would be somewhat hazardous. Some of the higher structural levels would seem more hopeful and the following are suggested: (1), The northwest corner of the District, along the Hiram Anticline, between Hiram and the Tygart Valley River, might hold gas in the Berea or Gordon Sands; (2), The southwestern corner of the District, south of the 1400-foot structure contour would seem to be at a high enough level to avoid water in the Berea Sand, and might tap oil or gas in this sand, shows of which have been found at several wells on both sides of the anticline; (3), The showing of oil reported in the Nestor (29) Well near Nestorville would indicate that additional oil might be found along the Belington Syncline, as the structure here is at a higher level than on Cove Run where water and oil were found in the Hardin (26) Well.

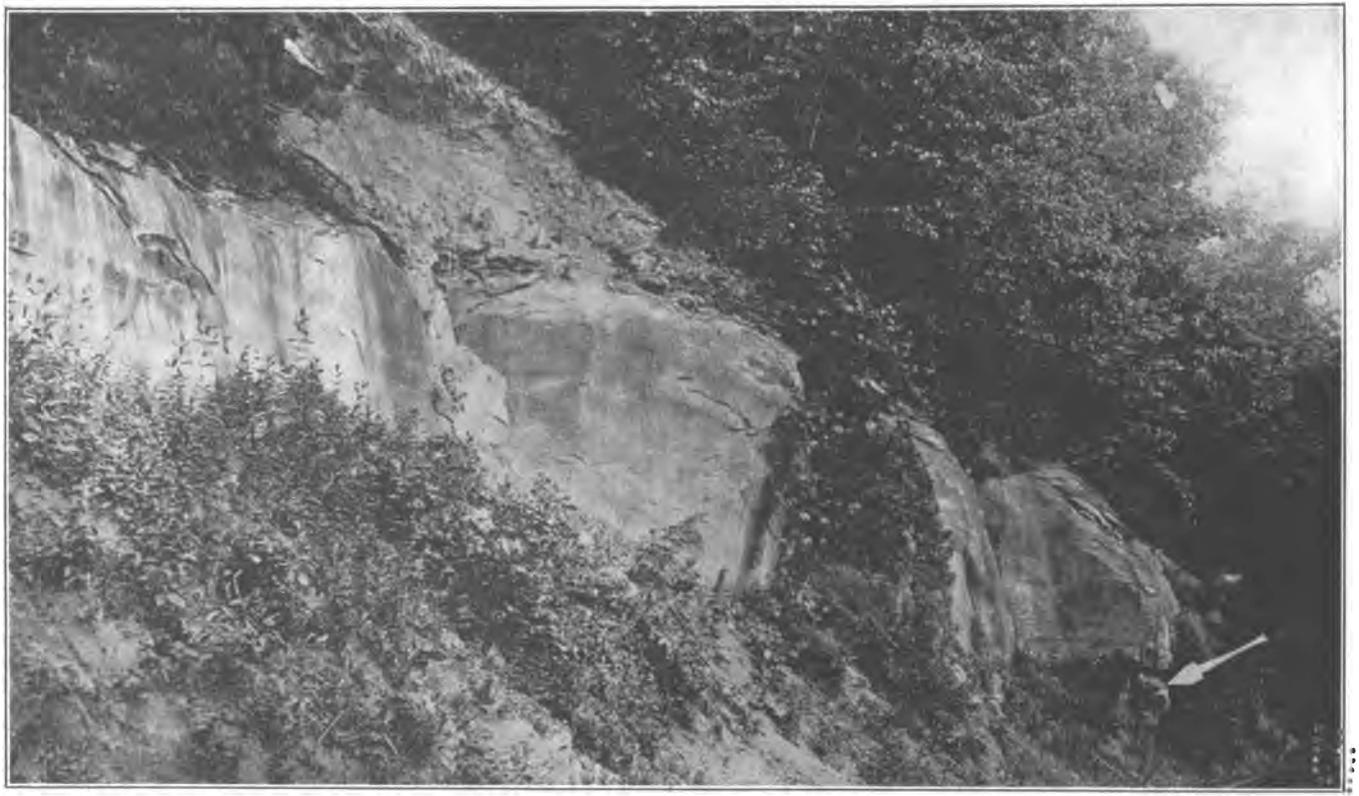


PLATE XIX.—Upper Kittanning Coal and Johnstown Cement Limestone along B. & O. R. R. just north of Meriden, Barbour County. The coal is visible at the right of the man at the upper left corner and the limestone at the end of the arrow point in the opposite corner. Heavy ledge between is sandstone.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS, GLADE DISTRICT, BARBOUR.

In Glade District no deep wells have ever been drilled, the only test for oil and gas having been the **Jesse Vannoy No. 1 (30) Well,** drilled primarily for salt water, on Sugar Creek, 0.4 mile southeast of Vannoys Mill. As previously noted on page 311, this well was reported to have been drilled to a depth of about 600 feet and to have made a show of oil and gas.

Prospective Oil and Gas Areas, Glade District.—The fact that Glade District lies in the eastern part of the County, near the Laurel Ridge, along the eastern side of which the oil sands crop to the surface, is evidence against the probability of oil or gas in quantity being found, but the following areas are suggested as being the most favorable: (1), The western portion of the District, embracing a strip of land about one mile and a half wide and six miles long, between Calhoun and Tacy, and lying near to the axis of the Hiram Anticline, might hold some gas in the Berea or other sands; (2), The land along the Belington Syncline might have some oil, though the sands may be saturated with salt water, and the oil may have all escaped along the exposed edges of the sands east of the Laurel Ridge.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS, BARKER DISTRICT, BARBOUR.

Barker District lies in the southeastern corner of the County, next to the Laurel Ridge, and no test wells have been drilled in it. It is traversed by the Belington Syncline which passes through the middle of it. The following areas are noted as the most hopeful for tests though the chances of finding oil and gas are slender: (1), That portion of the western edge lying between Calhoun and the Tygart Valley River, and nearest to the Hiram Anticline, might hold some gas; (2), If gas should be found along the western edge, then drilling would logically be continued eastward down the structural slope toward the Belington Syncline in the hope of finding oil.

It is doubtful whether anything can be found east of the syncline owing to the close proximity of the Laurel Ridge.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS,

VALLEY DISTRICT, BARBOUR.

Valley District lies in the southwestern corner of the county, next to Upshur and Randolph, and is traversed by the Hiram Anticline and the Belington Syncline. No tests have been drilled for oil and gas. The fact that the District lies near the mountains where the strata have been greatly disturbed is unfavorable for oil and gas, but the most hopeful locality for drilling would be along the axis of the Hiram Anticline near the western edge of the District, where there is some possibility of gas in the Big Injun or Berea Sands. If gas should be found in either of these, drilling would logically continue eastward toward the Belington Syncline in the hope of finding oil.

WELL RECORDS AND PROSPECTIVE AREAS, UPSHUR COUNTY.

EARLY HISTORY.

Probably the first wells drilled in Upshur County were some shallow tests to the Salt Sands made along the headwaters of the Little Kanawha River in the neighborhood of Ingo, Banks District. These wells made some oil and gas but were never put to any commercial use. The first deep test in the county was the Wm. Post No. 1 (42) Well, drilled on Turkey Run, Warren District, three miles north of Buckhannon, and completed prior to 1895. This well was a failure, and several others drilled later in the northern end of the county were equally non-productive. Only within the last ten years have any wells of commercial size been drilled, the first being those of the Frenchton Oil and Gas Company in the Frenchton Gas Field, followed soon afterward by the wells of the Buckhannon Relief Oil and Gas Company in the Stonecoal Field.

SUMMARIZED WELL RECORDS, UPSHUR COUNTY.

The following table gives a tabulated list of all the wells drilled in Upshur County, as also several others in contiguous territory of adjoining counties. The same general explanations given in connection with the table of wells in Barbour, page 312, are applicable here. The following abbreviations of Company names have been used:

Buckhannon Chem.	Buckhannon Chemical Company.
Buckhannon Fuel	Buckhannon Fuel Company.
B. R. O. & G.	Buckhannon Relief Oil and Gas Company.
Gnatty	Gnatty Oil Company.
Greater Pgh. O. & G.	Greater Pittsburgh Oil and Gas Company.
Guffey	Guffey and Galey.
Haddix	Haddix and Leading Creek Oil and Gas Company.
Hope	Hope Natural Gas Company.
Jesse Run	Jesse Run Oil and Gas Company.
Mandell	Mandell Oil Company.
Owens B. M.	Owens Bottle Machine Company.
Pa. O. & G.	Pennsylvania Oil and Gas Company.
Pgh. & W. Va.	Pittsburgh & West Virginia Gas Company.
South Penn	South Penn Oil Company.
Swisher et al.	W. H. Swisher and others.
Upshur O. & G.	Upshur Oil and Gas Company
W. Va. Central	West Virginia Central Gas Company.

Summarized Record of Tests for

No. on Map.	Farm Name and Number.	Magisterial District.	Owner.	Elevation.
31	W. D. Arnold No. 1	Warren	Gnatty	1135B
32	Enoch Post No. 1	Elk (Harrison)	Guffey	1065B
33	L. Nathan Lewis No. 1	Elk (Harrison)	Mandell	1080L
34	W. F. Post No. 1	Hackers Creek (Lewis)	Jesse Run	1365B
35	W. F. Post No. 2	Hackers Creek (Lewis)	Jesse Run	1280B
36	G. G. Cookman No. 2164	Hackers Creek (Lewis)	Hope	1115L
37	S. H. Luzader No. 1	Hackers Creek (Lewis)	Swisher et al	1135B
38	W. S. Starcher No. 2571	Hackers Creek (Lewis)	Hope	1205B
39	Mark Hersman No. 1	Hackers Creek (Lewis)	N. D. Goe	1055B
40	John Foster No. 1	Warren	Pa. O. & G.	1060L
41	I. S. Reger No. 1	Warren	Hope	1075B
42	Wm. Post No. 1	Warren	Upshur O. & G.	1410B
43	J. E. Green No. 1	Buckhannon	B. R. O. & G.	1445B
43A	F. & O. Leonard No. 7151	Buckhannon	Pgh. & W. Va.	1525B
44	T. A. Smith No. 1	Hackers Creek (Lewis)	W. Va. Central	1155B
45	Perry Summers No. 1	Skin Creek (Lewis)	C. E. Griffiths	1060B
45A	George Simons No. 1	Skin Creek (Lewis)	South Penn	1135B
46	J. F. Gould Heirs No. 2	Buckhannon	Buckhannon Fuel	1220B
47	J. F. Gould Heirs No. 1	Buckhannon	Buckhannon Fuel	1220B
48	John Morrison No. 1	Buckhannon	Crites & Allen	1250L
49	Louvina Linger No. 1	Buckhannon	Buckhannon Fuel	1380B
49A	J. J. Green No. 1	Buckhannon	Buckhannon Fuel	1450B
50	John Smith No. 1	Buckhannon	Buckhannon Fuel	1365B
51	Jacob Krise No. 1	Buckhannon	Buckhannon Fuel	1255B
52	Jas. R. White No. 1	Buckhannon	Buckhannon Fuel	1150L
53	Lee J. Lewis No. 1	Buckhannon	Buckhannon Fuel	1505L
54	Lee Westfall No. 1	Union	Upshur O. & G.	1447L
55	A. F. Moreland No. 2473	Union	Pgh. & W. Va.	1700B
56	B. J. Fallon No. 1	Union	W. Va. Central	1790B
57	James Duncan No. 1	Meade	Buckhannon Fuel	1365B
57A	Smith & Green No. 1	Meade	Buckhannon Fuel	1285B
58	Geo. Burner No. 1	Meade	Citizens	1432L
59	J. K. P. Koon Heirs No. 1	Washington	Pgh. & W. Va.	2083L
59A	Isherwood & Cody No. 1	Washington	Isherwood & Cody	2117B
59B	Grimm No. 1	Washington	Owens B. M.	......
60	Hazen Phillips No. 2659	Banks	Hope	1550B
61	Hazen Phillips No. 2658	Banks	Hope	1525B
62	J. S. Douglass No. 1	Banks	Frenchton O. & G.	1520B
63	Chas. M. Hyre No. 2656	Banks	Hope	1520L
64	Gordon B. Talbott No. 2657	Banks	Hope	1545L
65	Geo. P. Talbott No. 3416	Banks	Hope	1575B
66	John R. Francis No. 3287	Skin Creek (Lewis)	Hope	1230B
67	E. G. Davisson No. 1	Collins Settlement (Lewis)	E. G. Davisson	1090B
68	W. T. Wilson No. 1	Collins Settlement (Lewis)	Wilson & Butcher	992L
69	W. T. Wilson No. 2	Collins Settlement (Lewis)	Wilson & Butcher	1015B
70	A. K. Wilson No. 2	Collins Settlement (Lewis)	Wilson & Butcher	1010B
71	A. K. Wilson No. 1	Collins Settlement (Lewis)	Wilson & Butcher	1010B
72	S. M. Holt No. 1	Collins Settlement (Lewis)	John Farner	1020B
73	S. M. Holt No. 3	Collins Settlement (Lewis)	Sparling	......
74	S. M. Holt No. 2	Collins Settlement (Lewis)	John Farner	1060B
75	V. S. Lynch No. 1	Collins Settlement (Lewis)	Sparling & Neely	1035B
76	Wm. Mearns No. 1	Banks	Sparling	1075B
77	John Snyder No. 1	Banks	Sparling & Neely	1120B
78	G. G. Butcher No. 1	Collins Settlement (Lewis)	Sparling	1107L
79	J. W. Lake No. 1	Collins Settlement (Lewis)	Hague	1250B
80	Wm. Mullins No. 1	Hacker Valley (Webster)	Story & O'Hara	1205B
81	Vandervort & Pickens No. 1	Hacker Valley (Webster)	Haddix	1220B
82	Edward H. Peck No. 1	Banks	Buckhannon Chem.	2230B
83	Sherman Heirs No. 2	Banks	Greater Pgh. O. & G.	2355B
84	Silica Sand Co. No. 3	Banks	Greater Pgh. O. & G.	2505B
85	Butts-McCormick-Wilson No. 1	Banks	Greater Pgh. O. & G.	2310B
86	Silica Sand Co. No. 1	Banks	Greater Pgh. O. & G.	2050B
87	Silica Sand Co. No. 4	Banks	Greater Pgh. O. & G.	2505B
88	Silica Sand Co. No. 2	Banks	Greater Pgh. O. & G.	2035B
89	Sherman Heirs No. 1	Banks	Greater Pgh. O. & G.	2025B

Oil and Gas in Upshur County.

Lower Kittanning Coal.									
Depth. Top.	Thickness. Feet.	Big Lime. Top.	Big Injun Sand Top.	Berea Sand. Top.	Gordon Sand. Top.	Fifth Sand. Top.	Total Depth.	Producing Sand and Remarks.	No. on Map.
....	...	....	....	....	....	....	....	Dry hole	31
....	...	1390	1505	....	2110	2260	2481	Max., B. I., 6th, gas shows	32
....	...	....	....	....	....	....	....	Light gas	33
814	4	1608	1709	1955	2312	2541	2568	Berea, 5th, gas	34
751	5	1567	1650	1917	2330	2511	2582	Berea and Gord. gas shows	35
....	...	1425	1534	1770	....	2276	2753	5th, gas	36
....	...	....	....	....	....	....	....	Dry hole	37
....	...	1632	1714	1989	2356	2435	2551	5th gas	38
....	...	1466	1526	1773	....	2318	2426	Berea, 4th, gas show	39
...	...	1525	1595	1867	2205	2345	2345	Dry hole	40
610	5	1477	1554	1808	2220	....	2612½	Berea, light oil	41
681	...	1515	1680	1860	2212	2315	2497	Salt, gas show; B. Lm., oil show	42
....	...	1546	1621	....	2240	2358	2502½	Dry hole	43
....	...	1435	1485	1755	2095	2250	4502	Balltown? gas show	43A
....	...	1600	1690	1995	....	2403	2602	Weir, gas show	44
555	12	1365	1500	1680	1980	2165	2401	4th, oil show	45
....	...	....	....	....	....	....	....	Oil and gas show	45A
330	5	1275	1382	1571	2029	....	2065	Weir, oil show; 30-Ft. gas	46
....	...	1292	1346	1660	2030	....	2255	30-Ft., gas	47
....	...	....	....	....	....	....	....	30-Ft., gas	48
477	8	1433	1472	1810	2152	....	2410	B. I., Squaw, 30-Ft., oil show; Gord. gas	49
495	5	1490	1575	1865	2191	....	2398	4th, gas show	49A
490	2	1430	1495	1805	2077	....	2320	B. I., Gord., gas	50
....	...	1266	1381	1635	1962	2104	2404	Salt, Gord., 6th, gas show; Squaw, Gord., oil show	51
....	...	1255	1317	1630	1933	....	2804	B. I., G. Stray, oil show; G. Stray, 4th, gas	52
468	4	1440	1550	....	....	....	....	Dry hole	53
....	...	....	....	....	....	....	....	Dry hole	54
....	...	970	1107	....	....	....	2907	6th, gas	55
....	...	980	1070	1270	1680	1900	2453	4th and 5th, gas show	56
477	6	1436	1486	1816	2130	2262	2555	Salt, B. I., oil show; Salt, 5th, gas show	57
348	5	1323	1417	....	....	....	1994	30-Ft., gas	57A
....	...	1098	1190	1430	....	1980	2025	4th, light gas	58
....	...	915	1008	....	1624	1767	2992	G. Stray, Speechley, gas show	59
....	...	1045	1272	1397	....	....	1450	Max., Berea, oil show	59A
....	...	885	970	....	1605	....	2161	50-Ft., 4th, light gas	59B
....	...	1505	1575	1900	2195	....	2302	Salt, Squaw, oil show; B. I., 30-Ft., gas	60
....	...	1509	1620	1890	2200	....	2350	B. Lm.. Gord., gas; Weir, oil show	61
....	...	....	....	....	....	....	....	Dry hole	62
....	...	1496	1580	1910	2213	....	2342	II Cow Run, Gord., 4th, gas	63
...	...	1565	1675	1937	2263	....	2373	II Cow Run, Salt, Gord., gas; Salt, oil show	64
....	...	1540	1650	1910	2221	....	3200	B. I., Berea, 4th, gas show	65
....	...	1390	1495	1740	2085	2282	2662	30-Ft., gas show; 4th, 5th, oil show	66
....	...	....	....	....	....	....	....	B. I. and Gord., gas; B. I., oil show	67
....	...	....	....	....	....	....	....	Light oil	68
....	...	....	....	....	....	....	....	Max., gas show	69
....	...	765	995	....	1475	1670	2014	Salt and Gord., oil	70
....	...	....	....	....	....	....	....	Oil and gas	71
....	...	....	....	....	....	....	....	Oil and gas	72
....	...	....	....	....	....	....	....	Dry hole	73
....	...	....	....	....	....	....	....	Oil and gas	74
....	...	....	....	....	....	....	....	Dry hole	75
....	...	....	....	....	....	....	....	Salt, oil show	76
....	...	....	....	....	....	....	....	Dry hole	77
....	...	....	....	....	....	....	....	Oil and gas show	78
....	...	980	1215	....	1850	2040	2100	30-Ft.. gas	79
....	...	....	....	....	....	....	500+	Gas show	80
....	...	960	1125	1500	....	....	1807	Light gas	81
....	...	1240	1295	1565	....	....	1766	Berea, gas show	82
....	...	1230	1305	1526	1925	2072	3270	Berea, 6th, gas show; Salt, Gantz, oil	83
....	...	1490	1500	1787	....	....	....	Max., oil; B. I., gas	84
....	...	....	1300	1589	2010	2200	2252	Dry hole	85
....	...	1225	1325	....	....	....	1366	B. I., gas	86
....	...	1566	1786	....	....	....	1820	Salt, Max., B. I., gas show; Salt, Max., oil show	87
....	...	....	945	1309	....	....	1418	B. I., gas	88
....	...	1065	1300	....	....	....	1584	B. I., gas	89

In addition to the summarized records published above, the detailed logs of the most of these wells are available and will be published in the following pages. Some important records are lacking, but the information is fairly complete.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS,

WARREN DISTRICT, UPSHUR.

Warren District is situated in the northern end of the County, next to Lewis, Harrison, and Barbour. The Grassland Syncline cuts across the northwestern corner, and the Ruraldale Anticline and Ligonier Syncline enter it from the north but soon die out against the great monocline that forms the main structural feature of the County.

The W. D. Arnold No. 1 (31) Well, located on Right Branch of Gnatty Creek, 1.3 miles southwest of Century, was drilled by the Gnatty Oil Company, and was abandoned as a dry hole. Its record was not obtained as the General Manager of the Company refused to give out any information concerning it.

The following record, previously published in the Lewis-Gilmer Report, page 205, is that of a well drilled less than one mile north of the Upshur Line, and near the Ligonier Syncline. It makes enough gas to be used by one family, but was abandoned by the operators:

E. W. Post No. 1 Well Record (32).

Elk District, Harrison County; on Rooting Creek, ⅛ mile south of Johnstown; authority, Guffey and Galey; elevation, 1065′ B.

	Top. Feet.	Bottom. Feet.
Unrecorded (water, 50′)	0	130
Coal, Bakerstown	130	135
Sand, Big Dunkard	320	340
Gas Sand	470	485
Sand, Second Cow Run	575	615
Sand, Salt, (hole full water)	770	820
Sand, Maxton, (little gas in top)	970	1060
Big Lime (reduced hole to 6⅝″ at 1450′)	1390	1465
Limestone and sand, Keener	1465	1475
Red rock	1500	1505
Limestone and sand (little gas and water)......45′ Sandstone ....10 } **Big Injun**	1505	1560

	Top. Feet.	Bottom. Feet.
Sand, Squaw, (hole full of salt water at 1720′, flowing) (reamed hole at 8¼″ from 1450 to 1844′)	1710	1844
Sand, Gordon Stray	2090	2095
Sand, Gordon	2110	2120
Red rock and red sandstone, Fourth	2120	2185
Sand, Fifth	2260	2275
Sand, Bayard (little gas)	2290	2298
Sand, white, pebbles in bottom, Elizabeth	2310	2330
Slate, with white pebbles, to bottom	2475	2481

10″ casing, 118′; 8¼″, 828′; 6⅝″, 1844′.

The **L. Nathan Lewis No. 1 (33) Well,** drilled by the Mandell Oil Company, and located on Rooting Creek, 1.3 miles south of Johnstown, was abandoned as a dry hole. No record is available, but according to Enoch Starcher, a resident, the well supplies gas for three families from a pipe stuck into the ground after the casing was pulled.

The **W. F. Post No. 1 (34) Well,** located on a branch of Jesse Run, Hackers Creek District, Lewis, 2.5 miles southwest of Johnstown, was a gasser in the Fifth Sand, with a volume of 750,000 cubic feet daily, and a rock pressure of 820 pounds. Its record was published in full in the Lewis-Gilmer Report, page 207.

The **W. F. Post No. 2 (35) Well,** located on the same branch of Jesse Run, Hackers Creek District, Lewis, 2.6 miles southwest of Johnstown, showed oil and gas but was abandoned as a dry hole. Its complete record was published in the Lewis-Gilmer Report, page 207.

The **G. G. Cookman No. 2164 (36) Well,** located on Bull Lick of Jesse Run, Hackers Creek District, Lewis, 1.4 miles north of Aberdeen, was a Fifth Sand gasser, its record being published in full on page 208 of the Lewis-Gilmer Report.

The **S. H. Luzader No. 1 (37) Well,** located on a branch of Hackers Creek, one mile northwest of Aberdeen, Hackers Creek District, Lewis, was a dry hole, its record never having been obtained.

The **W. S. Starcher No. 2571 (38) Well,** located on Hackers Creek, 1 mile east of Berlin, Hackers Creek District, Lewis, was a Fifth Sand gasser, its record being published in full in the Lewis-Gilmer Report, page 218. This well is at the eastern edge of the great gas field that occurs along the Chestnut Ridge Anticline in Lewis County.

The **Mark Hersman No. 1 (39) Well,** located on Buckhannon Run, 1.2 miles southeast of Berlin, Hackers Creek District, Lewis, showed gas in the Berea and Fourth Sands, but was abandoned as a dry hole. Recently an attempt has been made to clean out the well and make it productive. Its record is published in the Lewis-Gilmer Report, page 219.

The following is the record of a dry hole drilled in the edge of Upshur along the axis of the Grassland Syncline. So far as known it made no show of oil or gas:

John Foster No. 1 Well Record (40).

Warren District; on Hackers Creek, 0.6 mile east of Aberdeen; authority, Pa. Oil & Gas Co.; elevation, 1060′ L.

	Top. Feet.	Bottom. Feet.
Coal, Bakerstown	195	197
Sand, Little Dunkard	310	345
Sand, Big Dunkard	385	415
Sand, Gas	450	470
Sand, Second Cow Run	552	610
Sand, Salt	780	940
Sand, Maxton	1130	1185
Little Lime	1485	1505
Pencil Cave	1505	1525
Big Lime	1525	1595
Sand, Big Injun	1595	1750
Sand, Squaw	1750	1785
Sand, Weir	1820	1860
Sand, Berea	1867	1920
Sand, Fifty-foot	1930	2030
Sand, Thirty-foot	2030	2060
Sand, Gordon Stray	2180	2200
Sand, Gordon	2205	2225
Sand, Fourth	2260	2285
Sand, Fifth (thickness not recorded)	2345	....

The **Isaac S. Reger No. 1 (41) Well,** located on Hackers Creek, 2.1 miles west of Ruraldale, and drilled by the Hope Natural Gas Company, was abandoned as a dry hole, but according to the driller it made a 5-barrel show of oil in the Berea Sand, and would probably have made a producer if it had been near a pipe-line. After the casing was pulled it made gas enough to supply one family for several years. Its record is published in full in connection with the Bear Knob Section, page 117.

The **Wm. Post No. 1 (42) Well,** located on Turkey Run, 3 miles north of Buckhannon, was drilled by the Upshur Oil and Gas Company and abandoned as a dry hole. It made shows of gas in two members of the Salt Sand group and a little black oil in the Big Lime. Its record, as furnished the Survey by F. G. Smith, of Buckhannon, is published in connection with the Turkey Run Section, page 123, having been drilled through the Fifth Sand to a depth of 2497 feet.

Prospective Oil and Gas Areas, Warren District.—The unfavorable tests already drilled would indicate that there are no extensive fields of oil or gas in the District, but the following areas are suggested for possible development: (1), The 5-barrel show of oil found in the Berea Sand in the I. S. Reger No. 1 (41) Well would indicate a possible pool near this old well. A location toward the west might find it or it might lie farther to the northeast along the same strike of the rocks; (2), The southern end of the Ruraldale Anticline between the Harrison County Line and Hackers Creek looks like a favorable locality to test for gas, the point where the anticline crosses Pecks Run being the most logical place to drill; (3), That portion of the District at the extreme southern end of the Ligonier Syncline, between Pecks Run village and Ruraldale and north of the 1400-foot structure contour, might hold some oil or gas, the abrupt change of dip being a favorable sign.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS, BUCKHANNON DISTRICT, UPSHUR.

Buckhannon District lies south of Warren and next to the Lewis County Line. It is traversed by no structural fold as it lies entirely along the great monocline between the Grassland Syncline and Hiram Anticline. Several test wells have been drilled and a small gas field has been developed near the Lewis County Line.

The following is the record of a deep test drilled near the center of the District, the record having been furnished the

Survey by J. J. Singleton, of Buckhannon, Manager of the Company. Nothing more than a smell of oil was found. The well starts 140 feet below an opening in the Redstone Coal:

J. E. Green No. 1 Well Record (43).

Buckhannon District; on Brushy Fork of Fink Run, 2 miles west of Buckhannon; authority, Buckhannon Relief Oil and Gas Co.; completed in 1908; elevation, 1445′ B.

	Thickness. Feet.	Total. Feet.
Conductor	9	9
Lime	16	25
Red rock	35	60
Lime (water, 85′)	25	85
Red rock	30	115
Slate	60	175
Lime	35	210
Coal, Harlem	5	215
Lime	25	240
Red rock	10	250
Lime (water, 255′)	67	317
Slate	7	324
Sand (water, 326′)	6	330
Black slate	5	335
Coal, Bakerstown	3	338
Slate	112	450
Lime	47	497
Sand, Big Dunkard	24	521
Lime	41	562
Slate	4	566
Sand, Burning Springs	18	584
Black slate	11	595
Lime	50	645
Brown slate	6	651
Sand, Gas	23	674
Slate	66	740
Slate and shells	68	808
Slate	7	815
Lime	15	830
Slate and shells	45	875
Salt Sand	15	890
Lime	110	1000
Sand, white and fine, Salt	100	1100
Slate	72	1172
Sand, Gas Sand of Rosedale	44	1216
Slate, very black	34	1250
Sand, Salt Sand of Rosedale	50	1300
Red rock	35	1335
Lime	70	1405
Red rock	80	1485
Little Lime, white and black	6	1491
Pencil Cave	25	1516
Lime	25	1541

	Thickness. Feet.	Total. Feet.
Sand, reddish	5	1546
Lime, white..69' } Big Lime (steel-line		
Lime, black... 6 } measure, 1592')	75	1621
Keener Sand 9' } Big Injun	74	1695
White sand 65 }		
Red rock	5	1700
Lime (change gradual to sandy lime)	35	1735
Lime, sandy	28	1763
Sand, loose, (smell of oil, 1767½') 5' } Squaw.	12	1775
Sand, hard, bluish 7 }		
Slate	13	1788
Lime, blue (block tools)	62	1850
Sand, white, very hard, Weir	35	1885
Slate and shells	33	1918
Sand, Berea, hard	6	1924
Slate	16	1940
Unrecorded	15	1955
White slate and shells	17	1972
Red rock	1	1973
White slate and shells	35	2008
Red rock	2	2010
Lime, sandy	27	2037
Red rock	3	2040
Lime, hard	10	2050
Slate	10	2060
Red rock and shells	50	2110
Red rock, gritty, with lime shells	110	2220
Sand, various colors, gray, Gordon Stray	7	2227
Sand, reddish-brown	13	2240
Sand, hard, gray, Gordon	24	2264
Lime	5	2269
Slate	29	2298
Lime, white	27	2325
Sand, gray, Fourth	17	2342
Gritty lime and shells	10	2352
Slate, white	6	2358
Sand, hard, gray, Fifth	144½	2502½

10" casing, 176'; 8" casing, 711'; dry hole.

The following is an abbreviated record of a very deep test drilled near Buckhannon and completed subsequent to the completion of field work in that vicinity, the record having been furnished by W. T. Griswold, geologist of the operating company. An interesting show of gas was found in what appears to be the Balltown Sand of Pennsylvania:

Florence and Olive Leonard No. 7151 Well Record (43A).

Buckhannon District; on Ratcliff Run, 1.5 miles southwest of Buckhannon; authority, Pittsburgh & West Virginia Gas Company; elevation, 1525′ B. (estimated from topographic contour); completed, July 24, 1917.

	Top. Feet.	Bottom. Feet.
Big Lime	1435	1485
Sand, Big Injun	1485	1655
Sand, Squaw	1660	1680
Sand, Weir	1685	1735
Sand, Berea	1755	1816
Sand, Fifty-foot	1856	1879
Sand, Gordon	2095	2101
Sand	2184	2188
Sand, Fourth	2210	2235
Sand, Fifth	2250	2260
Sand, Balltown? (gas show, 3786′)	3784	3804
Sand	4230	4255
Sand, Benson (Bradford?)	4265	4273
Total depth		4502

"Well unproductive and abandoned. Plugged August 6, 1917."

The following is the record of a well drilled in Lewis County near the Upshur Line. It made only a show of gas and was abandoned as a dry hole:

T. A. Smith No. 1 Well Record (44).

Hackers Creek District, Lewis County; on Laurel Lick, 2.6 miles south of Berlin; authority, W. Va. Central Gas Co.; elevation, 1155′ B.

	Top. Feet.	Bottom. Feet.
Slate, red rock, and sand	0	195
Coal, Elk Lick	195	200
Sand, Little Dunkard (water, 350′)	340	380
Slate and shells (water, 545′)	380	600
Sand, Gas	700	760
Sand, Second Cow Run	795	840
Sand, Salt	900	1040
Sand, Salt	1085	1300
Sand and shells	1300	1600
Big Lime	1600	1690
Sand, Big Injun	1690	1830
Sand, Weir (small gas show, 1955′)	1930	1990
Sand, Berea (poor and broken)	1995	2104
Red rock	2104	2250
Sand, Gordon Stray	2250	2283
Sand, Fourth	2283	2293
Sand, fine, hard, broken, Fifth	2403	2470
Slate and shells to bottom	2508	2602

No Bayard Sand; conductor, 16′; 10″ casing, 204′; 8¼″ casing 1055′; 6⅝″ casing, 1734′.

The **Perry Summers No. 1 (45) Well,** drilled on Right Fork of Stonecoal Creek, Skin Creek District, Lewis, about one mile west of the Upshur Line, was a dry hole except for a show of oil in the Fourth Sand. Its complete record was originally published in Volume I, page 255, and has been recently republished in the Lewis-Gilmer Report, page 409, of the Survey.

The **George Simons No. 1 (45A) Well,** drilled on Hersman Run, one mile northeast of Georgetown, Skin Creek District, Lewis, about two miles west of the Upshur Line, was reported to have made a show of oil and gas, but was abandoned as a dry hole. Its record could not be secured.

The **Stonecoal Gas Field,** located in Buckhannon and Meade Districts, on the waters of Stonecoal Creek, near the Lewis County Line, has several productive gas wells, which are now the property of the Buckhannon Fuel Company, successors to the Buckhannon Relief Oil and Gas Company. Several well-kept records in this field have been furnished the Survey by Mr. J. J. Singleton, Manager of the former corporation, and Mr. E. W. Martin, an official of the latter company. The gas production ranges through various sands, including the Big Injun, Thirty-foot, Gordon Stray, Gordon, and Fourth Sands. The following well has been recently drilled, and, according to Mr. Martin, made about 200,000 cubic feet of gas daily:

J. F. Gould Heirs No. 2 Well Record (46).

Buckhannon District; on Pigeonroost Run of Stonecoal, 1.7 miles north of Abbott; authority, Buckhannon Fuel Company; elevation, 1220′ B.

	Top. Feet.	Bottom. Feet.
Conductor	0	16
Unrecorded (water at 70′; about 6 bailers per hour; hole full at 95′)	16	330
Coal, Lower Kittanning	330	335
Sand, Second Cow Run (water, 10 bailers; hole full at 430′)	380	520
Sand, Salt	540	567
Sand, Salt (gas, 720′)	700	763
Sand, Salt	795	835
Sand, Salt	969	1063
Sand	1100	1133
Unrecorded (red rock at 1140′)	1133	1260

	Top. Feet.	Bottom. Feet.
Little Lime	1260	1267
Pencil Cave	1267	1275
Big Lime	1275	1382
Sand, Big Injun	1382	1460
Sand, Squaw	1485	1503
Sand, Weir (water and show of oil)	1527	1565
Sand, Berea	1571	1724
Red rock	1724	1741
Lime	1741	1755
Red rock	1755	1910
Sand, Thirty-foot (gas, 1917')	1910	1934
Sand, Gordon	2029	2060
Total depth		2065

10" casing, 306'; 8" casing, 619'; 6½" casing, 1308'; set packer at 1647'; anchor, 277'; shot with 40 quarts at 1912-1922'.

The following well was a light gasser in the Thirty-foot Sand:

J. F. Gould Heirs No. 1 Well Record (47).

Buckhannon District; on Pigeonroost Run, 1.5 miles north of Abbott; authority, Buckhannon Fuel Company; elevation, 1220' B.

	Thickness. Feet.	Total. Feet.
Conductor	12	12
Slate	66	78
Lime	29	107
Slate	15	122
Coal, Upper Freeport	3	125
Slate	8	133
Lime	19	152
Slate	34	186
Lime	17	203
Slate and shells	17	220
Slate	16	236
Lime	32	268
Slate	12	280
Lime	24	304
Slate	56	360
Lime	45	405
Sand, Second Cow Run	95	500
Sand	16	516
Slate	34	550
Sand, Salt	22	572
Slate	23	595
Lime	63	658
Slate and shells	48	706
Sand, Salt	76	782
Slate and shells	24	806
Sand, hard, Salt	36	842
Sand, Salt	58	900

	Thickness. Feet.	Total. Feet.
Slate and shells	80	980
Sand, Salt	83	1063
Red rock	29	1092
Sand	22	1114
Lime	56	1170
Red rock	30	1200
Lime	15	1215
White slate	8	1223
Lime	12	1235
Slate and shells	33	1268
Little Lime	18	1286
Pencil Cave	6	1292
Big Lime	54	1346
Big Injun Sand	147	1493
Slate	7	1500
Squaw Sand	18	1518
Slate	10	1528
Sand, Weir	55	1583
Slate and shells	77	1660
Sand, Berea	75	1735
Red rock	26	1761
Slate and shells	15	1776
Red rock	133	1909
Sand, Thirty-foot, (gas, 1917')	24	1933
Slate and shells	97	2030
Sand, Gordon	34	2064
Slate and shells	36	2100
Slate	54	2154
Lime	3	2157
Slate and unrecorded to bottom	98	2255

The **John Morrison No. 1 (48) Well**, located on Pigeonroost, 1.5 miles north of Abbott, was a light gasser, reported to have produced from the same sand as the Gould No. 2. Its detailed record was not secured.

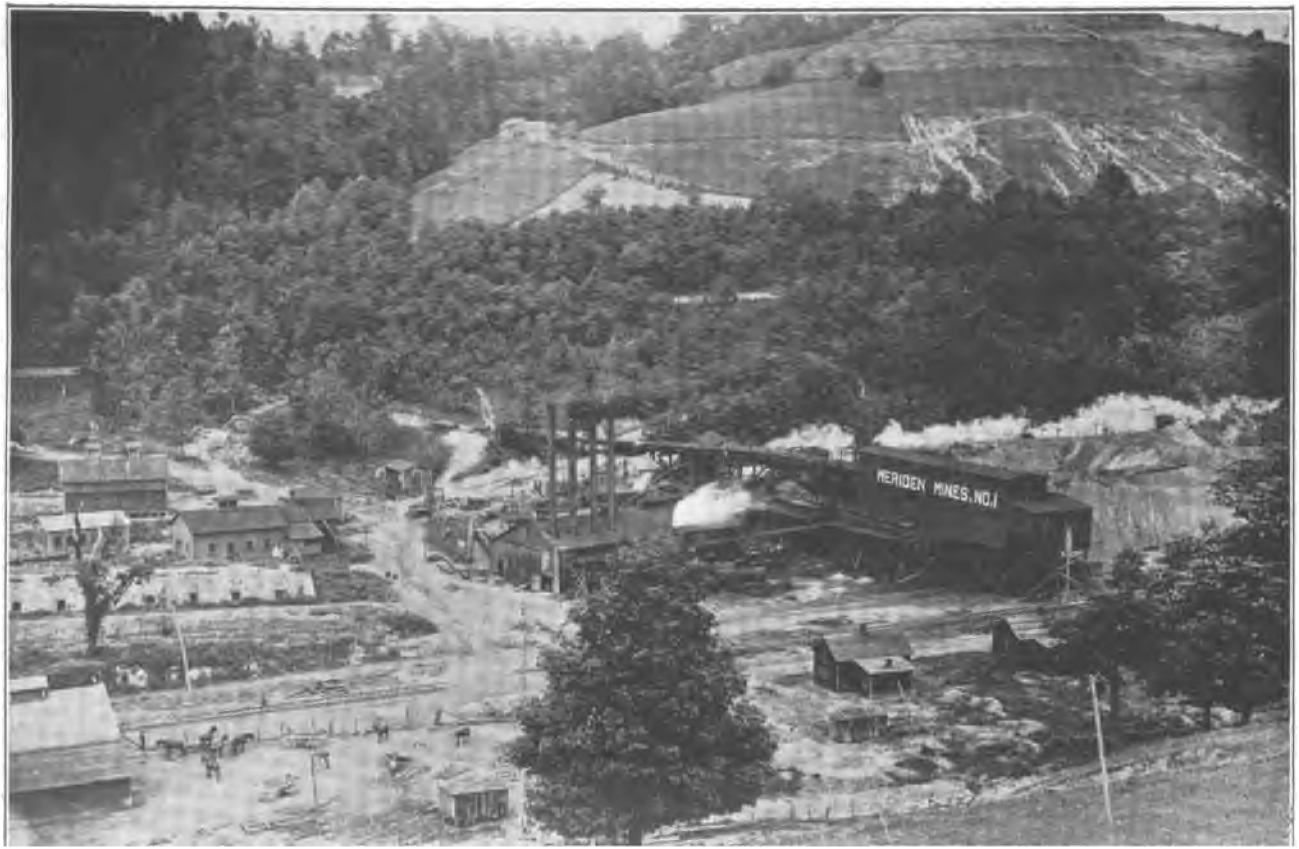
The following well is a Gordon Sand gasser:

Louvina Linger No. 1 Well Record (49).

Buckhannon District; on Pigeonroost Run, 1.6 miles northeast of Abbott; authority, Buckhannon Fuel Company; elevation, 1380' B.

	Thickness. Feet.	Total. Feet.
Red clay	5	5
Red rock	20	25
Sandy lime	11	36
Red rock	49	85
White slate	25	110
Gray lime	12	122
White slate	3	125
Coal, Bakerstown	1	126

	Thickness. Feet.	Total. Feet.
Dark slate	1	127
Gray lime	2	129
White slate	13	142
Blue lime	14	156
Reds	24	180
Lime	30	210
Sand, (water), Big Dunkard	24	234
Slate	12	246
Coal, Upper Freeport (show of gas)	8	254
Black slate	6	260
Lime	81	341
Slate, white	15	356
Lime	20	376
Sand, Burning Springs	16	392
Black shale	8	400
Gray lime	52	452
Black shale and sand, Gas (gas)	11	463
Black slate	7	470
Lime	7	477
Coal, Lower Kittanning	8	485
Slate	28	513
Sand, Second Cow Run	44	557
Black slate	13	570
Lime shale, first gas sand	70	640
Sand, hard, Salt	112	752
Slate and sand	26	778
Black shale	17	795
White slate	99	894
Slate	12	906
Black shale	24	930
Sand and shells, Salt	86	1016
White sand, Salt	14	1030
Slate and shell	45	1075
White sand, Salt	25	1100
Black slate	16	1116
Hard sand, Salt	64	1180
Red rock	20	1200
Lime	32	1232
Maxton Sand	59	1291
Red rock	56	1347
Slate and shells	25	1372
Lime	19	1391
White slate	9	1400
Lime	12	1412
Red rock	5	1417
Little Lime	13	1430
Pencil Cave	3	1433
Big Lime	39	1472
Sand, Big Injun (gas, 1478′; show of oil, 1490′)	154	1626
Slate	4	1630
Sand 15′ }		
Sand (oil and water, 1650′) 25 } Squaw	40	1670
Slate and shells	10	1680
Lime	5	1685
Sand	19	1704


MERIDEN MINES. NO. 1

	Thickness. Feet.	Total. Feet.
Slate and lime shells	19	1723
Sand, Weir	35	1758
Slate and shells	9	1767
Sand	33	1800
Slate and shells	10	1810
Sand, Berea	67	1877
Red rock	64	1941
Lime	8	1949
Red rock	41	1990
Sand and shells, Fifty-foot	6	1996
Red rock	56	2052
Sand, Thirty-foot (show of oil and gas, 2058')	14	2066
Slate	5	2071
Lime shells	8	2079
Lime, sandy	24	2103
Slate	49	2152
Sand, Gordon, (gas, 2154-64')	34	2186
Slate and shells	40	2226
Sand and shells, Fourth	4	2230
Slate and shells	167	2397
Sand and shells, Bayard	3	2400
Unrecorded to bottom	10	2410

The following well made only a show of gas in the Fourth Sand and was abandoned as a dry hole:

J. J. Green No. 1 Well Record (49A).

Buckhannon District; on Pigeonroost Run of Stonecoal, 1.3 miles northward from Abbott; completed in 1916; elevation, 1450' B.

	Top. Feet.	Bottom. Feet.
Coal, Upper Freeport	270	275
Sand, Burning Springs	320	350
Sand, Gas (water at 545', 6 bailers per hour)	375	420
Coal, Lower Kittanning	495	500
Sand, Salt	635	710
Sand, Salt	720	800
Sand, Salt	835	940
Sand, Salt	954	980
Sand, Salt	1040	1110
Sand, Salt	1245	1415
Little Lime	1431	1450
Pencil Cave	1485	1490
Big Lime	1490	1510
Sand, Big Injun (red rock at 1610')	1575	1675
Sand, Squaw	1745	1776
Sand, Weir (water in different places, 1795')	1785	1795
Sand	1845	1860
Sand, Berea	1865	1900
Red rock	1900	1906
Sand, Gantz	1906	1965
Red rock	1965	2000

	Top. Feet.	Bottom. Feet.
Sand, Thirty-foot	2107	2116
Red rock	2116	2119
Sand, Gordon Stray	2119	2142
Sand, Gordon	2191	2206
Sand, Fourth (little gas, 2300-2306')	2296	
Total depth		2398

The following well was a light gasser in the Gordon Sand:

John Smith No. 1 Well Record (50).

Buckhannon District; on Brushlick Run, 2.5 miles southwest of Atlas; authority, Buckhannon Fuel Co.; elevation, 1365' B.

	Thickness. Feet.	Total. Feet.
Conductor	16	16
Unrecorded	4	20
Red clay	10	30
Lime	10	40
Red rock	10	50
White slate	10	60
Coal, Bakerstown	2	62
Slate	13	75
Lime	5	80
Slate	4	84
Lime, white	16	100
Red rock	25	125
Sand	25	150
Slate	50	200
Sand, Big Dunkard	30	230
Slate	30	260
Coal, Upper Freeport	5	265
Slate	10	275
Lime	35	310
Slate	15	325
Lime	35	360
Slate	20	380
Sand, Burning Springs	20	400
Slate	50	450
Sand, Gas	35	485
Slate	5	490
Coal, Lower Kittanning	2	492
Slate, black	28	520
Lime, white	20	540
Slate	30	570
Sand, very hard, Second Cow Run	20	590
Slate	15	605
Sand, Salt	70	675
Sand, hard	65	740
Sand, black, Salt	50	790
Lime, white	20	810
Slate, white	5	815
Sand, Salt	25	840

		Thickness. Feet.	Total. Feet.
Slate, black		20	860
Salt Sand		95	955
Slate, black		85	1040
Sand, Salt		15	1055
Slate		70	1125
Sand, Salt		65	1190
Reds		20	1210
Sand		75	1285
Slate		5	1290
Sand, Maxton		40	1330
Reds		25	1355
Slate and shells		65	1420
Red rock		10	1430
Big Lime		65	1495
Sand (gas)	5′	Big Injun 65	1560
Lime	40		
Sand	20		
Reds		5	1565
Lime		65	1630
Slate		10	1640
Sand		10	1650
Reds		5	1655
Slate		5	1660
Squaw Sand		20	1680
Slate		15	1695
Sand		40	1735
Slate		15	1750
Sand, Weir		30	1780
Slate		10	1790
Sand, hard		10	1800
Slate		5	1805
Berea Sand		90	1895
Red rock		20	1915
Sand, Gantz		5	1920
Red rock		25	1945
Sand, Fifty-foot		5	1950
Red rock		20	1970
Sand		15	1985
Red rock		15	2000
Sand, Thirty-foot		20	2020
Slate		5	2025
Reds		25	2050
Sand, Gordon Stray		15	2065
Red rock		12	2077
Sand, Gordon (gas, 2088½′)		13	2090
Slate		20	2110
Sand		20	2130
Slate		43	2173
Fourth Sand			
Unrecorded to bottom		147	2320

The following well was abandoned as a dry hole but made a little gas that is used in the Krise residence:

Jacob Krise No. 1 Well Record (51).

Buckhannon District; on Brushlick Run, 2.3 miles southwest of Atlas; authority, Buckhannon Fuel Co.; elevation, 1255' B.

	Thickness. Feet.	Total. Feet.
Unrecorded	120	120
Coal	2	122
Unrecorded	23	145
Coal, Brush Creek	5	150
Unrecorded	110	260
Sand, Big Dunkard	20	280
Unrecorded	80	360
Sand	5	365
Unrecorded	20	385
Coal, Upper Kittanning (water and gas, 388')	5	390
Unrecorded	82	472
Sand shells	23	495
Unrecorded	35	530
Sand, Second Cow Run	25	555
Slate	55	610
Lime shells	46	656
Lime	10	666
Sand, Salt	29	695
Lime shells	25	720
Sand, Salt (gas, 795', steel line)	135	855
Slate	40	895
Sand, Salt	10	905
Slate and shells	95	1000
Sand, Salt	75	1075
Slate	10	1085
Red rock	25	1110
Slate	21	1131
Lime	45	1176
Red rock	34	1210
Lime	20	1230
Red rock	22	1252
Little Lime	8	1260
Pencil Cave	6	1266
Big Lime	115	1381
Sand, Big Injun (steel line)	44	1425
Red rock	6	1431
Sand	5	1436
Red rock	12	1448
Sand	6	1454
Lime	36	1490
Sand (oil show, 1515')....30'		
Slate (steel line, 1525')...10 } Squaw	60	1550
Sand 20		
Slate	5	1555
Sand, Weir	75	1630
Slate	5	1635
Sand, Berea (pebbles at 1641')	30	1665
Slate	49	1714
Sand, Gantz	20	1734
Slate	7	1741

	Thickness. Feet.	Total. Feet.
Sand, Fifty-foot	32	1773
Red rock	30	1803
Sand	17	1820
Red rock	5	1825
Sand, Thirty-foot	20	1845
Red rock	22	1867
Sand, Gordon Stray	30	1897
Red rock, sand slate (steel line)	52	1949
Sand shells	13	1962
Sand, Gordon (show of oil and gas)	10	1972
Red rock	23	1995
Sand shells	3	1998
Slate and sand shells (oil smell, 2050')	59	2057
Sand, Fourth	14	2071
Slate, sand shells	33	2104
Sand, dark, Fifth (oil smell, 2112')	8	2112
Slate, black	26	2138
Sand and slate break	97	2235
Lime shells	5	2240
Slate	23	2263
Sand, Bayard (gas) (steel line, 2267')	10	2273
Sand and slate	43	2316
Slate and lime shells	19	2335
Sand, Elizabeth (oil or gas smell)	42	2377
Slate to bottom (steel line)	27	2404

The following well made a little gas but was soon doned:

Jas. R. White No. 1 Well Record (52).

Buckhannon District; on Stonecoal Creek, 1.4 miles southw Atlas; authority, Buckhannon Fuel Co.; elevation, 1150' L.

	Thickness. Feet.	Total. Feet.
Conductor	10	10
Lime (hole full of water)	14	24
Slate	6	30
Lime	40	70
Slate	13	83
Coal, Brush Creek	2	85
Slate	15	100
Lime	15	115
Slate	25	140
Lime	23	163
Slate (water, 20 bailers)	24	187
Lime	13	200
Slate	5	205
Sand, Big Dunkard (hole full of water)	20	225
Slate, (water)	5	230
Coal, Upper Freeport	8	238
Slate	12	250
Lime	14	264

	Thickness. Feet.	Total. Feet.
Slate	36	300
Lime	5	305
Coal, Upper Kittanning	5	310
Slate	20	330
Sand, Gas (water ran over hole)	31	361
Black slate	14	375
Lime	14	389
Black slate	11	400
White slate	46	446
Lime	54	500
Sand, Salt	33	533
Lime	17	550
Sand, Salt	13	563
Slate and shells (gas forced water over derrick)	59	622
Lime	18	640
Slate	7	647
Sand, Salt	103	750
Slate and shells	95	845
Sand, Salt	63	908
Black slate	6	914
Lime	16	930
Black slate	30	960
Sand, Salt	20	980
Slate	4	984
Sand, Salt	46	1030
Red rock	10	1040
Lime	15	1055
Slate and shells	31	1086
Red rock and shells	14	1100
Red rock	55	1155
Lime	10	1165
Red rock	15	1180
Lime	8	1188
Slate, white	12	1200
Lime	10	1210
Slate	25	1235
Red rock	20	1255
Big Lime	62	1317
Big Injun Sand (red rock at 1380'; show of oil, 1438½'; lots of paraffine, looked like slush)	143	1460
Slate	10	1470
Lime	14	1484
Sand, Squaw	54	1538
Slate	22	1560
Sand, Weir	50	1610
Slate and shells	20	1630
Sand, white, Berea	10	1640
Slate	10	1650
Fifty-foot Sand	50	1700
Slate	8	1708
Lime	10	1718
Red rock	10	1728
Lime	22	1750

	Thickness. Feet.	Total. Feet.
Red rock	5	1755
Lime	15	1770
Red rock	9	1779
Sand, Thirty-foot	66	1845
Slate and shells	22	1867
Sand, Gordon Stray (slate at 1890'; steel line, 1906'; show of oil and little gas, 1904')	45	1912
Slate and shells	21	1933
Sand, Gordon	12	1945
Slate and shells	40	1985
Sand	35	2020
Sand, Fourth (gas, 2048½', steel line)	36	2056
Slate and shells	104	2160
Slate	50	2210
Sandy slate	20	2230
Lime	35	2265
Slate	5	2270
Black slate	15	2285
Sand, Bayard and shells	23	2308
Slate, soft	37	2345
Lime, sandy	20	2365
Slate	35	2400
Slate and shells	65	2465
Bastard lime	25	2490
Slate and shells to bottom	314	2804

The following well was abandoned as a dry hole, but the partial record, as furnished the Survey by F. G. Smith, of Buckhannon, gives valuable data on the underground coals. The hole starts 65 feet, by hand-level, below the Elk Lick Coal:

Lee J. Lewis No. 1 Well Record (53).

Buckhannon District; on Glade Fork of Stonecoal, 1.6 miles northeast of Abbott; authority, Buckhannon Fuel Co.; elevation, 1505' L.

	Thickness. Feet.	Total. Feet.
Conductor	12	12
Unrecorded (8" casing, 163')	156	168
Coal, Brush Creek	2	170
Unrecorded	110	280
Coal (gas at 282'), Upper Freeport	3	283
Unrecorded	31	314
Sand, Burning Springs	16	330
Unrecorded	65	395
Sand, Gas	20	415
Unrecorded	53	468
Coal, Lower Kittanning	4	472
Unrecorded	28	500
Sand (water, 505')	17	517

	Thickness. Feet.	Total. Feet.
Unrecorded	67	584
Coal, Upper Mercer	2	586
Unrecorded	24	610
Sand, Salt	38	648
Unrecorded	65	713
Sand, Salt	62	775
Unrecorded	45	820
Sand, Salt	130	950
Unrecorded	205	1155
Sand, Maxton	59	1214
Unrecorded	114	1328
Red rock	50	1378
Sand shells	50	1428
Red rock	6	1434
Pencil Cave	6	1440
Big Lime	110	1550
Sand, Keener	5	1555
Sand, Big Injun (top at 1555')		

Prospective Oil and Gas Areas, Buckhannon District.—The several dry holes that have been drilled in Buckhannon District outside of the Stonecoal Field offer strong evidence against a large future production, but the following areas are mentioned as being the most logical regions for drilling: (1), That portion of the District lying immediately northeast of the Stonecoal Field toward Rocky Ford, the 1700-foot structure contour being along the most hopeful productive belt for gas in the Thirty-foot, Gordon, and Fourth Sands. (2), There is a considerable amount of untested territory in the region north of Lorentz which is only partially condemned by the dry holes that have been drilled around it. (3), Only one well has been drilled in the immediate vicinity of Buckhannon where the financial risk would be large, but the returns from even light wells would be good, owing to the ready market for the gas. (4), The extreme southern end of the District, in the vicinity of Hinkleville, has not been condemned by any dry holes and drilling would probably be justified by the favorable show of gas in the well at Sago, farther east.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS,

UNION DISTRICT, UPSHUR.

Union District occupies the northeastern corner of the County, next to Barbour and Randolph, and is therefore removed from the proved oil and gas areas of the State. Three wells have been drilled, one of which made a favorable showing of gas.

The **Lee Westfall No. 1 (54) Well,** drilled by the Upshur Oil and Gas Company, and located on Left Fork of Little Sand Run, one mile south of Reger, was abandoned as a dry hole. No detailed record of the well could be secured from any member of this company nor any statement of sands or shows of oil or gas that may have been found.

The following is the record of a light gas well that has been shut in by the company that drilled it:

A. F. Moreland No. 2473 Well Record (55).

Union District; on Middle Fork of Laurel Fork of Big Sand Run, 1.5 miles southeast of Hinkle; authority, Pittsburgh and West Virginia Gas Company; completed, March 30, 1912; elevation, 1700′ B.

	Top. Feet.	Bottom. Feet.
Native coal, Upper Mercer	40	....
Big Lime	970	1107
Sand, Big Injun	1107	1203
Sand, Squaw	1215	....
Sand, Bayard (gas, 1960′ and 1985′)	1959	2000
Sand, black?, Warren First?	2205	2215
Total depth		2907

The following well was a deep test in the same vicinity, but made only a small amount of gas in the Fourth and possibly a little in the Fifth, and was abandoned as a dry hole:

B. J. Fallon No. 1 Well Record (56).

Union District; on Laurel Fork of Big Sand Run. 2.2 miles southeast of Hinkle; authority, West Virginia Central Gas Company; completed, September 24, 1912; elevation, 1790′ B.

	Thickness. Feet.	Total. Feet.
Unrecorded	20	20
Sand, hard, Second Cow Run	60	80
Lime and slate	470	550
Red rock (?)	150	700
Slate, white	10	710
Sand, Salt (hole full of water, 715′)	60	770
Slate, white	30	800
Red rock	100	900
Sand, Maxton	5	905
Slate	10	915

	Thickness. Feet.	Total. Feet.
Lime	15	930
Slate and shells	25	955
Red rock (cave)	10	965
Little Lime	5	970
Slate, white, Pencil Cave	10	980
Big Lime	90	1070
Sand, Big Injun	80	1150
Lime, hard	50	1200
Lime, shells, and slate	30	1230
Sand, black, and hard, Weir	15	1245
Slate and shells, white	25	1270
Sand, white, Berea	40	1310
Slate and shells	170	1480
Red rock	40	1520
Sand, Thirty-foot	15	1535
Red rock and shells	25	1560
Slate, sand, and shells	10	1570
Red rock, sand and shells	110	1680
Sand, white, Gordon	55	1735
Red rock and shells	65	1800
Sand, Fourth (small amount of gas, 1828')	31	1831
Slate and shells, hard	69	1900
Sand, Fifth	27	1927
Sand, shells, and slate	233	2160
Slate, white, and shells	60	2220
Slate and shells	80	2300
Slate, black, to bottom	153	2453

"Fifth Sand, hard and fine from 1901 to 1910 feet; from 1910 to 1920 feet, sand was coarse and full of white pebbles; from 1920 to 1927 feet, sand was hard and fine. After drilling through Fifth Sand, gas would burn two feet above casing."

Prospective Oil and Gas Areas, Union District.—From a structural viewpoint, the most promising territory in Union District is the eastern portion along the Middle Fork River, which is near the crest of the Hiram Anticline. If commercial wells should be found in this region, drilling could be extended westward away from the anticline.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS, MEADE DISTRICT, UPSHUR.

Meade District occupies the western central portion of the County, and like Union is somewhat out of proved territory. Only three wells have been drilled, one of which was a commercial producer, the other two having been abandoned. The following well was abandoned as a dry hole, although it made shows of both oil and gas:

James Duncan No. 1 Well Record (57).

Meade District; on Bearpen Fork of Stonecoal, 1.4 miles northwest of Abbott; authority, Buckhannon Fuel Company; elevation, 1365′ B.

	Thickness. Feet.	Total. Feet.
Clay	5	5
Red rock	15	20
Lime	65	85
Red rock	25	110
Slate	25	135
Lime	15	150
Coal, Bakerstown	2	152
Slate	28	180
Lime	76	256
Slate	12	268
Coal, Upper Freeport	6	274
Slate	109	383
Sand, Gas	47	430
Slate	47	477
Coal, Lower Kittanning	6	483
Slate	25	508
Sand, Second Cow Run (water, 509′)	22	530
Slate	5	535
Sand	15	550
Slate	61	611
Lime and shells	19	630
Sand, Salt	15	645
Slate and shells	15	660
Lime	10	670
Slate	30	700
Sand	12	712
Slate	38	750
Slate and shells	40	790
Sand, Salt	55	845
Slate	40	885
Sand, Salt	35	920
Slate	6	926
Sand, Salt	14	940
Slate, black	40	980
Lime and shells	15	995
Slate, black	15	1010
Lime	30	1040
Slate, black	60	1100
Sand, Salt, hard (gas, 1102′)	15	1115
Slate	13	1128
Sand, Salt (light show of oil, 1155′)	72	1200
Red rock	27	1227
Lime	61	1288
Lime, hard	10	1298
Red rock	19	1317
Sand, hard	15	1332
Slate, white	5	1337
Lime	23	1360
Sand, white and hard, Maxton, (water, 1366′)	15	1375

	Thickness. Feet.	Total. Feet.
Slate, white	7	1382
Lime	18	1400
Slate, white	20	1420
Red rock	5	1425
Little Lime	6	1431
Pencil Cave	5	1436
Big Lime	50	1486
Sand, Big Injun (show of oil, 1675')	194	1680
Slate	5	1685
Sand, hard, (water, 1720')...35' Sand ...45 } Squaw	80	1765
Slate and shells	51	1816
Sand, Berea	85	1901
Red rock	73	1974
Lime	8	1982
Red rock and shells	28	2010
Sand shells, white, Thirty-foot	45	2055
Red rock, gritty, with sand shells	25	2080
Sand, brown, Gordon Stray	20	2100
Slate and sand shells	30	2130
Sand shells, hard, Gordon	5	2135
Slate, white and soft	10	2145
Lime, sandy	15	2160
Slate and shells	40	2200
Sand, hard and white, Fourth	25	2225
Sand, soft and broken	5	2230
Slate and sand shells	5	2235
Slate, soft	27	2262
Sand, hard, Fifth (gas)	6	2268
Slate, white (steel line, 2284')	127	2395
Sand shell	20	2415
Chocolate sand, Bayard	20	2435
Slate, dark	15	2450
Slate, light	25	2475
Slate, white	45	2520
Slate and shells	35	2555

"Driller reported gas at 2262-2268', but other man said it was lower down. H. A. Darnall reported gas in chocolate sand."

The following well is a gasser that has been lately drilled:

Smith & Green No. 1 Well Record (57A).

Meade District; on Pigeonroost Run of Stonecoal, 1.3 miles north of Abbott; completed in 1916; elevation, 1285' B.

	Top. Feet.	Bottom. Feet.
Conductor	0	16
Unrecorded (hole full of water at 45')	16	115
Sand, Big Dunkard	115	133
Coal, Upper Freeport	141	146
Sand	270	282

	Top. Feet.	Bottom. Feet.
Sand, Gas	317	336
Coal, Lower Kittanning	348	353
Coal, Clarion	370	375
Unrecorded (water at 380'; 6 bailers per hour)	375	404
Sand, Second Cow Run	404	464
Sand, Salt	474	573
Sand, Salt	690	800
Sand, Salt	914	952
Sand, Salt	1012	1123
Sand, Salt	1128	1200
Red rock	1200	1225
Sand, hard, Maxton	1225	1252
Little Lime	1279	1293
Red rock	1306	1321
Pencil Cave	1321	1326
Big Lime	1326	1417
Sand, Big Injun	1417	1522
Sand, Squaw (water, 1570')	1567	1619
Sand, Weir	1662	1772
Red rock (little gas, 1852')	1772	1919
Sand, Fifty-foot	1919	1947
Sand, Thirty-foot (gas, 1961-1967')	1947	1981
Total depth		1994

10" casing, 146'; 8" casing, 578'; 6½" casing, 1356'; packer set 65' from bottom; shot with 40 quarts of glycerine at 1960-1970'.

The **George Burner No. 1 (58) Well,** drilled along the Buckhannon River, at Sago, made a small amount of gas in the Fourth Sand. Its record, which was first published in Volume I(a), page 351, of the Survey, has been used in connection with the Sago Section, page 134, of the present Report. Concerning the result of the well, the following is quoted from the driller's log:

> "In five-foot slaty sand (Fourth) a showing of gas was visible, and a small quantity is yet flowing around the plug. Probably enough to supply a dozen fires. In the Big Injun Sand (1190-1360') a showing of something resembling asphalt was found."

Prospective Oil and Gas Areas, Meade District.—The tests already drilled in Meade District and surrounding territory do not indicate that a large amount of gas will be found, but the following regions are indicated as the most hopeful: (1), The western portion of the District, between the Stonecoal and Frenchton Gas Fields, might reasonably be supposed to hold a further supply of gas, as some of the sands, particularly the Fourth, have been productive in both fields. (2), The fact that a favorable show of gas was found in the Fourth Sand in the well as Sago would indicate that other producing territory might be found in the region between this well and the Stonecoal and Frenchton Fields, possibly in the vicinity of French Creek or Adrian. (3), The presence of gas in commercial quantity in the Craddock Gas Field along the Buckhannon River would indicate that an additional supply of gas, or possibly some oil, might be found in the extreme southern end of Meade District, west of Alton and Alexander.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS, WASHINGTON DISTRICT, UPSHUR.

Washington District lies in the eastern portion of the County, next to the mountains, where most of the hydrocarbons presumably have escaped through fissures in the strata. Three wells have been drilled, all of which were abandoned as dry, although two of them made shows of gas and the other made shows of oil.

The J. K. P. Koon Heirs No. 1 (59) Well, drilled on Laurel Run, 1 mile east of Queen, made a show of gas in the Gordon Stray Sand and also in a deep sand that is possibly the Speechley. According to the driller's report, enough gas was found to burn with a flame four or five feet high at the well-mouth. The detailed record of the well is published as a part of the Sunny Point Section, page 143.

The Isherwood and Cody No. 1 (59A) Well, drilled by Isherwood and Cody, on their own land at Stockerts on Panther Fork of Buckhannon River, was abandoned as a dry hole, although it made shows of oil in the Maxton and Weir (?) Sands. The well was drilled to a total depth of 1450 feet. Its record is published in connection with the section for Stockerts, page 139.

The following record, furnished the Survey by E. W. Martin, of Buckhannon, is that of a well drilled subsequent to the completion of field work in the County, but is valuable not only for the shows of gas but also for the two seams of coal reported:

Grimm No. 1 Well Record (59B).

Washington District; on Leonard Run of Middle Fork River, about 1 mile southwest of Queen (exact location not indicated on Map IV); authority, Owens Bottle Machine Company.

	Thickness. Feet.	Total. Feet.
Conductor	11	11
Sand, white	10	21
Shale, black	11	32
Quicksand	2	34
Sand	31	65
Coal, Eagle?	2	67
Shale	13	80
Lime	50	130
Shale, black	4	134
Sand, hard	62	196
Slate and shells	112	308
Coal, Sewell	5	313
Shells and slate	27	340
Sand, white, Rosedale Salt	120	460
Slate	15	475
Lime, gritty	50	525
Red rock	40	565
Sand, white, Maxton	55	620
Shells and slate	80	700
Lime, red	20	720
Shells and slate	60	780
Lime	15	795
Slate, black	25	820
Lime, white	25	845
Slate and shells	40	885
Big Lime (gas, 955')	85	970
Sand, Big Injun	50	1020
Red rock	5	1025
Sand, Squaw	70	1095
Shells and slate	55	1150
Sand, Weir	50	1200
Shells and slate	20	1220
Lime	105	1325
Red rock	95	1420
Sand, red, Fifty-foot (gas, 1425')	50	1470
Red rock	30	1500
Sand, Thirty-foot	25	1525
Shells and slate	80	1605
Sand, white, Gordon	30	1635
Slate	10	1645
Sand, white, Fourth (gas, 1675')	55	1700
Red rock	10	1710
Sand, Fifth	15	1725
Slate and shells	150	1875
Sand. black, Elizabeth	10	1885
Slate and shells to bottom	276	2161

"Made enough gas for two or three families, but was abandoned."

Prospective Oil and Gas Areas, Washington District.—The tests already drilled in Washington District are discouraging but not conclusive as there is a large amount of ground not yet condemned. The hazard of drilling further wells is great, but the following localities are noted as being the most promising: (1), The region immediately northwest of Tenmile, where a very noticeable change in the structural dip makes a terrace in the sands, offers a little hope for oil or gas. (2), The presence of a considerable amount of gas at Craddock would indicate that further supplies might be found somewhere along the same structural monocline to the northeast, possibly in the vicinity of Palace Valley or Hemlock.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS, BANKS DISTRICT, UPSHUR.

Banks District occupies the extreme southern end of the County, next to Webster and Randolph. There are two small gas fields with commercial production and in another locality oil has been found that might have developed into commercial production if it had been carefully handled.

The **Frenchton Gas Field,** located about one mile north of Frenchton, on the waters of French Creek, contains six wells, four of which are classed as light gas producers, and the other two are dry holes. This field was first opened up by the Frenchton Oil and Gas Company, of Buckhannon, which drilled the first five wells, but the property was later acquired by the Hope Natural Gas Company, which drilled another well that was a dry hole. Gas from this field supplies the towns of Frenchton, Adrian, French Creek, Rock Cave, and others. The production is mainly from the Thirty-foot, Gordon, and Fourth Sands, but shows of both oil and gas have been found in several other sands. The original Frenchton Company kept excellent records of these wells, most of which are available through the courtesy of Charles E. Hiner, J. J. Singleton, and others.

The following was a light gasser in the Thirty-foot Sand:

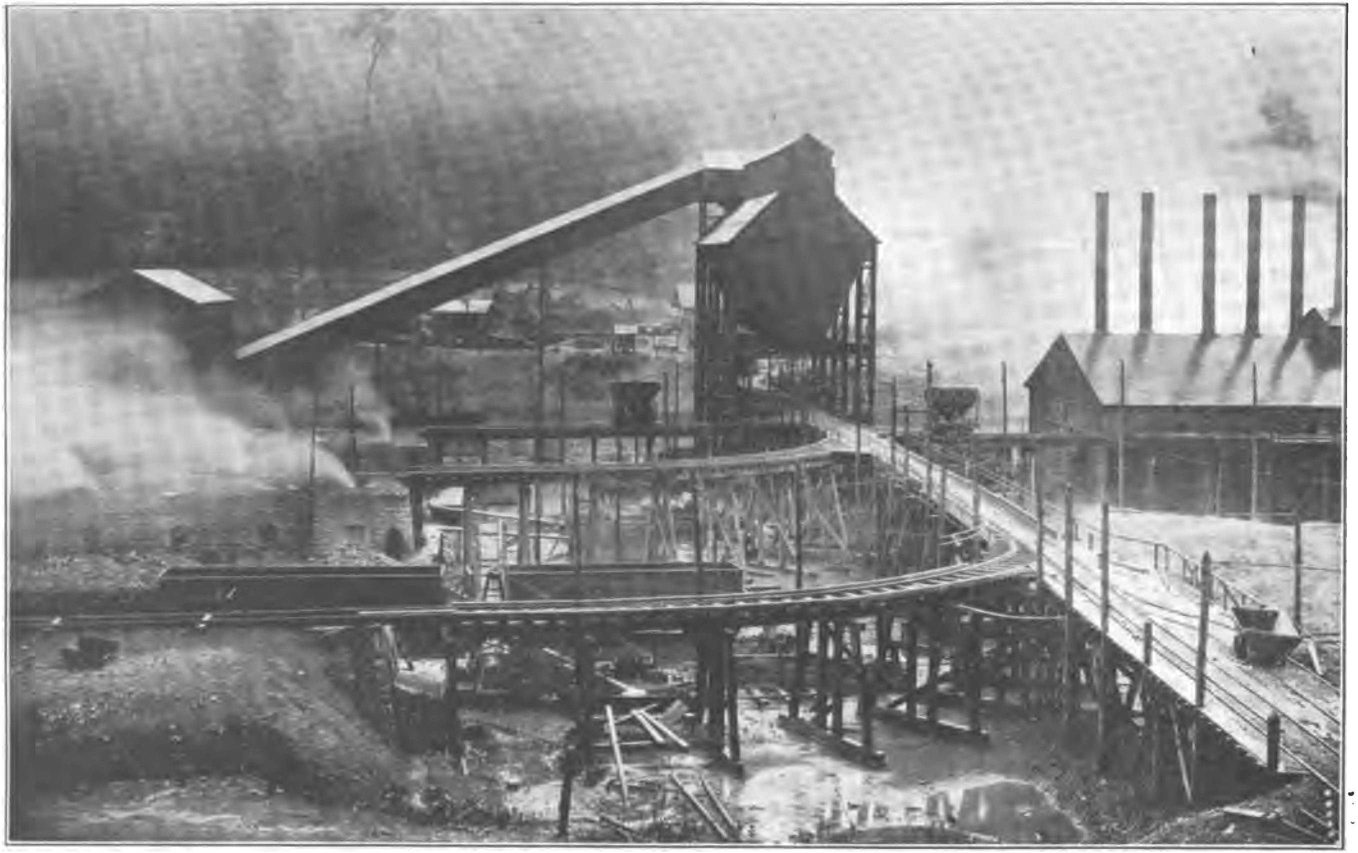


PLATE XXI.—Davis Colliery Company No. 1 Mine (Nos. 807 and 808 on Map IV), at Coalton, Randolph County, looking toward south opening.

Hazen Phillips No. 2659 Well Record (60).

Banks District; 1.2 miles northeast of Frenchton; authority, Hope Natural Gas Company; completed, December 15, 1909; elevation, 1550' B.

	Thickness. Feet.	Total. Feet.
Conductor	13	13
Lime, blue and hard (water, 36')	87	100
Slate	15	115
Lime	19	134
Slate	6	140
Lime, hard	15	155
Slate and sand, Big Dunkard	30	185
Slate	55	240
Lime, hard, blue	18	258
Sand, Burning Springs	42	300
Slate, white	12	312
Lime, gritty	18	330
Slate, white	20	350
Lime, hard, sandy	20	370
Slate, white	20	390
Sand, Second Cow Run	80	470
Shale, black	30	500
Slate, white	8	508
Lime, gritty, hard	20	528
Shale, brown	10	538
Slate and shells	12	550
Sand, Salt	40	590
Shale, brown	5	595
Lime, gritty	10	605
Slate, white	15	620
Lime, hard	10	630
Shale, black	25	655
Slate, white	24	679
Sand, Salt	12	691
Slate and shells	24	715
Shale, black	65	780
Sand, limy	6	786
Black shale and shells	14	800
Sand, Salt (light show of oil, 805'; water, 822'; light show of gas, 960'), and unrecorded	220	1020
Sand, Salt	52	1072
Black shale and lime shells	80	1152
Lime, gritty	20	1172
Slate, white	8	1180
Lime and black slate	20	1200
Sand, Salt	60	1260
Red rock	40	1300
Slate and lime shells	90	1390
Red rock	25	1415
Lime, white, hard	20	1435
Red rock	15	1450
Slate, black	8	1458
Lime, hard	14	1472

	Thickness. Feet.	Total. Feet.
Slate	13	1485
Red rock	20	1505
Big Lime	70	1575
Big Injun Sand (light show of gas, 1580′; hard and limy, 1600′; soft sand and white pebbles, 1715′; smell of oil and gas at 170′; gray sand and hard, 1730′; water, 1750′)	205	1780
Sandy shells	45	1825
Sand, chocolate-colored, Squaw (hard sand, 1834′; oil and water, 1835-1844′; oil and water, 1860′)	55	1880
Slate and shells	20	1900
Sand, hard, Berea	30	1930
Red rock	12	1942
Sand, Gantz	6	1948
Red rock and shells	4	1952
Sand, Fifty-foot	10	1962
Red rock and shells	30	1992
Slate	16	2008
Red rock and sand shells	95	2103
Sand, Thirty-foot (gas, 2106′)	12	2115
Slate	6	2121
Sand	4	2125
Sand, red, Gordon Stray	12	2137
Slate	3	2140
Sand	8	2148
Slate and shells	47	2195
Sand, Gordon	35	2230
Sand	23	2253
Slate	32	2285
Sand, Fourth	6	2291
Slate to bottom	11	2302

10″ casing, 310′; 6⅝″ casing put in November 12, 1909; 5″ casing put in December 4th. Packer on bottom of 5″ casing. Rock pressure, 550 pounds to the square inch.

The Hazen Phillips No. 2658 (61) Well, the record of which is published in connection with the Frenchton Section, page 147, was a light gasser in the Gordon Sand, and also made a show of gas in the Big Lime and a show of oil in the Weir Sand.

The **J. S. Douglass No. 1 (62) Well**, located 0.9 mile northeast of Frenchton and just east of Beechtown Church, was abandoned as a dry hole, no record of it being available.

The following was probably the best well in the Frenchton Field, with production in the Gordon and Fourth Sands:

Charles M. Hyre No. 2656 Well Record (63).

Banks District; on French Creek, 0.8 mile north of Frenchton; authority, Hope Natural Gas Company; elevation, 1520′ L.

	Thickness. Feet.	Total. Feet.
Soapstone, white (water, 15′)	17	17
Reds	24	41
Soapstone (water)	2	43
Lime	17	60
Sand, Moundsville	10	70
Slate	106	176
Sand and slate	8	184
Soapstone	22	206
Sand, Big Dunkard	30	236
Slate, white	12	248
Lime	10	258
Slate, white	12	270
Sand, Burning Springs	12	282
Slate, white	6	288
Lime, gritty	10	298
Slate	27	325
Lime	5	330
Slate, white	28	358
Sand, hard	14	372
Lime and shells	25	397
Sand, Gas	61	458
Slate and lime	12	470
Lime, shelly	10	480
Lime, sandy	20	500
Slate	38	538
Sand, Second Cow Run (gas, 542′)	62	600
Slate	6	606
Sand, Salt	26	632
Slate	18	650
Sand, Salt	78	728
Slate and shells	22	750
Shale, black	25	775
Sand, Salt	65	840
Shale, brown	10	850
Sand, Salt (smell of oil, 856′)	86	936
Slate, black	124	1060
Sand, Salt	28	1088
Black shale and lime shells	110	1198
Sand, Salt	66	1264
Pencil	6	1270
Lime	42	1312
Sand	44	1356
Red rock	34	1390
Lime	6	1396
Slate, black	22	1418
Red rock	32	1450
Slate, black	30	1480
Red rock	16	1496
Big Lime	84	1580
Sand, Big Injun	130	1710

by Google

		Thickness. Feet.	Total. Feet.
Break		5	1715
Sand, Squaw (2 bailers of water, 1765′)		80	1795
Slate, white		5	1800
Sand ... 40′ Sand, white and hard ... 40	Weir	80	1880
Slate and shells		30	1910
Sand, Berea		25	1935
Red rock		25	1960
Shells and slate		40	2000
Red rock and sand shells		40	2040
Slate and shells, white and red		30	2070
Sand, hard ... 30′ Red rock ... 0 Sand, white pebbles ... 12	Thirty-foot	42	2112
Slate, white		8	2120
Sand, Gordon Stray		18	2138
White slate and shells		75	2213
Sand, Gordon (best gas; bottom of pay, 2235′)		27	2240
Slate and shells		45	2285
Sand, Fourth, (gas, 2287′ to 2293′)		9	2294
Unrecorded to bottom		48	2342

Rock pressure, 600 pounds to the square inch.

The following well was a light gasser in the Gordon Sand.

Gordon B. Talbott No. 2657 Well Record (64).

Banks District; 0.6 mile north of Frenchton; authority, Hope Natural Gas Company; elevation, 1545′ L.

	Thickness. Feet.	Total. Feet.
Conductor	9	9
Lime	21	30
Red rock	20	50
Lime	10	60
Slate	30	90
Lime	15	105
Red rock	20	125
Lime	15	140
Black slate and shells	60	200
Sand	20	220
Slate, black	10	230
Sand	15	245
Slate	20	265
Sand, Little Dunkard	15	280
Slate	10	290
Sand, Big Dunkard	22	312
Slate	113	425
Sand, Burning Springs	25	450
Lime	20	470
Sand, Gas (water, 530′)	76	546
Slate	10	556
Lime	9	565

	Thickness. Feet.	Total. Feet.
Sand, Second Cow Run (gas, 575′)	91	656
Slate, black	19	675
Lime, hard	25	700
Shale, brown	40	740
Lime	10	750
Slate and shells	50	800
Slate	20	820
Sand, Salt	25	845
Slate and shells	75	1020
Shale, black	45	1065
Sand, Salt (gas, 1090′)	31	1096
Shale, brown	14	1110
Slate	45	1155
Lime, gray	15	1170
Slate, black	80	1250
Shale, black	15	1265
Sand, Salt (little show of oil and gas, 1292′)	55	1320
Red rock	20	1340
Lime, gray	78	1418
Red rock	18	1436
Lime, gritty, hard	6	1442
Red rock	7	1449
Lime, gritty	16	1465
Red rock	15	1480
Slate	6	1486
Lime	22	1508
Slate	24	1532
Red rock	33	1565
Big Lime	110	1675
Sand 105′ Break 6 Sand 20 **Big Injun**	131	1806
Slate and shells	30	1836
Sand, Squaw (reduced hole, 1865′)	40	1876
Slate	25	1901
Sand, Weir	31	1932
Break	5	1937
Sand, Berea	40	1977
Slate and shells	16	1993
Red rock and shells	27	2020
Sand, Fifty-foot	25	2045
Slate, white	20	2065
Slate and sand shells	25	2090
Red rock and shells	10	2100
Sand, hard, Thirty-foot	15	2115
Red rock and shells	31	2146
Sand	4	2150
Slate, white	6	2156
Sand, Gordon Stray	14	2170
Slate and shells	93	2263
Sand, Gordon (gas, 2263′ to 2275′)	15	2278
Slate, white, to bottom	95	2373

10″ casing, 285′; 8¼″ casing, 732′; total depth of 6½″ hole, 1952′; 5 3/16″ casing, 1965′.

The following well was drilled by the Hope Natural Gas Company subsequent to the transfer of the leaseholds and proved to be commercially dry as only light shows of gas were found:

George P. Talbott No. 3416 Well Record (65).

Banks District; 1.3 miles north of Frenchton; authority, Hope Natural Gas Company; completed, July 22, 1914; elevation, 1575′ B.

	Top. Feet.	Bottom. Feet.
Gas Sand (water, 540′)	440	590
Sand, Second Cow Run	665	695
Sand, Salt	890	945
Sand, Salt	960	998
Sand, Salt	1135	1195
Sand, Maxton	1412	1456
Little Lime	1500	1523
Pencil Cave	1523	1540
Big Lime	1540	1650
Sand, Big Injun (gas, 1815′)	1650	1838
Sand, Squaw	1840	1905
Sand, Berea (gas, 1926′)	1910	1974
Sand, Gantz	1982	2021
Sand, Fifty-foot	2078	2103
Sand, Thirty-foot	2145	2162
Sand, Gordon Stray	2190	2215
Sand, Gordon	2221	2231
Sand, Fourth (gas, 2329′)		2334
Total depth		3200

The following well was drilled in Lewis County, one-fourth mile from the Upshur Line, but was abandoned as a dry hole, although light shows of both oil and gas were found:

John R. Francis No. 3287 Well Record (66).

Skin Creek District, Lewis County; on Skin Creek, 2.1 miles north of Frenchton; authority, Hope Natural Gas Co.; completed, February 10, 1914; elevation, 1230′ B.

	Top. Feet.	Bottom. Feet.
Gas Sand (water, 385′ and 390′)	280	400
Sand, Second Cow Run	530	560
Sand, Salt	710	775
Sand, Salt	835	875
Sand, Salt	930	990
Sand, Maxton	1315	1330
Little Lime	1360	1380
Big Lime	1390	1495
Sand, Big Injun	1495	1595

	Top. Feet.	Bottom. Feet.
Sand, Squaw	1615	1700
Sand, Berea	1740	1795
Sand, Fifty-foot	1830	1845
Sand, Thirty-foot (gas, 1996')	1988	2007
Sand, Gordon	2085	2125
Sand, Fourth, (oil show)	2156	2166
Sand, Fifth (oil show)	2282	2289
Total depth		2662

The **E. G. Davisson No. 1 (67) Well**, drilled on West Fork River, one-half mile west of Crawford, Lewis County, and 3.2 miles west of the Upshur Line, was a gas well of 100,000 cubic feet daily capacity, mostly from the Big Injun, the Gordon Sand having only a small amount. Salt water and a show of oil were also found in the Injun. The rock pressure of the well was 700 pounds.

In the southern panhandle of Lewis and in the adjoining territory of Upshur and Webster, fourteen wells have been drilled, nearly all having made shows of oil and gas, mostly from the lower members of the Pottsville Sands, which produce oil at Rosedale, Braxton County. Concerning this oil in the panhandle, White[8] says the following:

> "The oil is of light gravity and amber color, but is so mixed up with water that no paying wells have ever been found, although a fine 'showing' has been obtained in nearly every one of the dozen or more wells that have been drilled. It appears to be impossible to case off the water without also shutting out the oil."

The records of only a few of these wells are available. According to W. T. Wilson, of Bablin, who drilled several of them, the **W. T. Wilson No. 1 (68)** made a little oil; the **W. T. Wilson No. 2 (69)**, the record of which is published on page 167 of the Lewis-Gilmer Report of the Survey, was a dry hole; the **A. K. Wilson No. 2 (70)**, the record of which was published on page 72 of the Lewis-Gilmer Report, made oil and gas from the Salt Sand and a little oil from the Gordon; the **A. K. Wilson No. 1 (71)** made oil and gas; the **S. M. Holt No. 1 (72)** made oil and gas; the **S. M. Holt No. 3 (73)** was a dry hole; the **S. M. Holt No. 2 (74)** made oil and gas; the **V. S. Lynch No. 1 (75)** was a dry hole; the **Wm.**

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[8] I. C. White, Volume I(a), W. Va. Geol. Survey, p. 375; 1904.

Mearns No. 1 (76) was reported to have flowed some thick oil from the Salt Sand at 230 feet; the **John Snyder No. 1 (77)** was a dry hole; the **G. G. Butcher No. 1 (78)**, according to a resident, made an oil show and enough gas to blow out water, and "lots of salt water". The well still makes a little gas. The **J. W. Lake No. 1 (79)**, the record of which is published on page 432 of the Lewis-Gilmer Report of the Survey, made considerable gas from the Thirty-foot Sand, a little oil, and much salt water. The **Wm. Mullins No. 1 (80)**, located in Webster County, on a branch of Right Fork of Little Kanawha River, 1 mile southwest of Bois, was reported by a resident to have been drilled more than 500 feet deep, and made some gas, but was abandoned as a dry hole. The **Vandervort and Pickens No. 1 (81)**, the record of which is published in connection with the Cleveland Section, page 153, and previously published in Volume I(a), page 393, of the Survey, is reported to have made some gas, but was plugged, the record failing to show in what formation the gas was found.

The **Craddock Gas Field,** located in the vicinity of Craddock, along the Buckhannon River, contains eight wells, four of which were classed as dry holes, one made a fair showing of oil, and the other three produced gas commercially, mostly from the Big Injun Sand. The gas from this field is now used by the Buckhannon Chemical Company in its plant at Selbyville, but the supply has failed rapidly, making it necessary to use coal as auxiliary fuel. The following well was abandoned as a dry hole, although it made a light show of gas in the Berea Sand. It starts 288 feet, by hand-level, below the Lower Kittanning Coal:

Edward H. Peck No. 1 Well Record (82).

Banks District; on Pecks Run of Little Kanawha River, 1 mile east of Canaan; authority, Buckhannon Chemical Company; completed, October, 1912; elevation, 2230′ B.

	Thickness. Feet.	Total. Feet.
Loam and quicksand, black	22	22
Sand, gray, Salt	35	57
Slate, black	28	85
Sand, gray, Salt	45	130

	Thickness. Feet.	Total. Feet.
Slate, black	30	160
Sand, gray, Salt	35	195
Slate, black	15	210
Sand, gray, Salt	55	265
Slate, black	30	295
Limestone, gray	30	325
Slate, black	95	420
Sand, gray, Salt	25	445
Slate, black	5	450
Coal, Hughes Ferry	3	453
Slate, black	35	488
Limestone, white	32	520
Slate, black	5	525
Sand, white, Salt	30	555
Slate, black	65	620
Sand, gray, Salt	20	640
Slate, black	15	655
Limestone, white	67	712
Slate, black, Sewell Coal horizon	10	722
Sand, white, Salt of Rosedale (salt water, 830')	133	855
Limestone, white	15	870
Slate, black	45	915
Red rock	70	985
Limestone, blue	4	989
Red rock	31	1020
Limestone, gray	15	1035
Red rock	20	1055
Sand, gray	50	1105
Limestone, gray	25	1130
Slate and shells, black	55	1185
Red rock	55	1240
Limestone, gray, Big Lime	55	1295
Sand, white, Big Injun	45	1340
Slate, black	5	1345
Limestone, blue	100	1445
Sand, pink	10	1455
Limestone, white	110	1565
Sand, white, Berea (light gas in top)	30	1595
Red rock and shells	35	1630
Slate and shells, gray	55	1685
Sand, pink, Fifty-foot	12	1697
Slate and shells, white	43	1740
Red rock	5	1745
Sand, gray, Thirty-foot	12	1757
Red rock and shells to bottom	9	1766

10" casing, 22' 10"; 8" casing, 407'; 6⅝" casing, 989'.

According to R. B. Rexroad, of Canaan, the following well made a 10- to 12-barrel show of oil, apparently in the Squaw Sand. Being remote from pipe-lines, it was abandoned as a dry hole:

Sherman Heirs No. 2 Well Record (83).

Banks District; on Pecks Run of Little Kanawha River, 0.7 mile northwest of Craddock; authority, Greater Pittsburgh Oil and Gas Company; completed in 1906; elevation, 2355′ B.

	Thickness. Feet.	Total. Feet.
Conductor	16	16
Sand, (hole full of water, 60′)	59	75
Lime	45	120
Slate	30	150
Sand	40	190
Lime	30	220
Slate	22	242
Coal, Campbell Creek	3	245
Slate (water at 250′; 14 bailers per hour)	30	275
Lime	105	380
Sand, Salt (just a show of oil, 390′)	30	410
Lime	40	450
Slate	50	500
Sand	30	530
Slate	15	545
Coal, Castle	3	548
Sand	52	600
Slate	5	605
Lime	15	620
Coal, Sewell "B"	5	625
Slate	30	655
Sand	10	665
Slate, black, Sewell Coal horizon ("should be Craddock Coal but we washed it out and found black slate only")	5	670
Lime	15	685
Slate	40	725
Lime	50	775
Sand	35	810
Slate	35	845
Sand	45	890
Slate	10	900
Sand	35	935
Red rock	130	1065
Slate	25	1090
Red rock	20	1110
Lime	50	1160
Red rock	70	1230
Lime	45	1275
Red rock	30	1305
Sand	18	1323
Slate	22	1345
Lime	20	1365
Slate	15	1380
Sand, Maxton	45	1425
Slate	5	1430
Big Lime	96	1526
Sand, Big Injun (gas, 1528′)	44	1570
Lime	110	1680

	Thickness. Feet.	Total. Feet.
Red rock	3	1683
Sand, Squaw (show of oil, 1683′)	7	1690
Red rock	20	1710
Sand, Weir	10	1720
Slate and shells	50	1770
Red rock	100	1870
Sand, Gantz	15	1885
Red rock	5	1890
Sand 25′ } Fifty-foot	60	1950
Red rock 10		
Sand 25		
Red rock	85	2035
Sand, Thirty-foot	25	2060
Red rock	7	2067
Slate	5	2072
Sand, Gordon Stray	38	2110
Red rock	45	2155
Sand, Gordon (gas, 2170′)	55	2210
Slate	375	2585
Lime	85	2670
Slate and shells	15	2685
Lime	50	2735
Slate and shells	215	2950
Lime	50	3000
Slate and shells	150	3150
Lime	65	3215
Slate and shells	55	3270
Lime	...	....

10″ casing, 103′; 8¼″ casing, 715′; 6⅝″ casing, 1693′.

The **Silica Sand Company No. 3 (84) Well,** located on the ridge one-third mile northwest of Craddock, the record of which is published in connection with the Craddock Section, page 157, has produced gas for several years from the Big Injun Sand. In the summer of 1915, the hole was drilled deeper in the hope of finding another productive sand, but, so far as known, the result was a failure.

The following well was a dry hole, no shows of oil or gas being reported:

Butts-McCormick-Wilson No. 1 Well Record (85).

Banks District; on Hell Run, 0.9 mile southwest of Craddock; authority, Greater Pittsburgh Oil and Gas Company; completed, August 16, 1905; elevation, 2310′ B.

	Top. Feet.	Bottom. Feet.
Unrecorded (water, 20′)	0	150
Sand, Salt	150	180
Lime	225	275

	Top. Feet.	Bottom. Feet.
Sand, Salt	275	325
Lime	350	400
Unrecorded (water, 440')	400	500
Lime	500	550
Sand, Salt	550	605
Red rock	725	839
Slate and lime shells	830	905
Sand, Maxton	1300	1320
Big Lime	1320	1589
Sand, Big Injun (steel line)	1589	1609
Slate	1609	1613
Sand. Squaw	1613	1626
Sand, white, Berea	1626	1935
Lime	1980	2010
Sand, dark, Gordon	2010	2080
Shells and slate	2080	2200
Sand, sharp, Fifth	2200	2252
Total depth (steel line)		2252

10" casing, 53'; 8¼" casing, 485'.

The following well was estimated at 3 to 5 million feet in the Big Injun Sand:

Silica Sand Co. No. 1 Well Record (86).

Banks District; on Buckhannon River, at Craddock; authority, Greater Pittsburgh Oil & Gas Company; completed in June, 1905; elevation, 2050' B.

	Top. Feet.	Bottom. Feet
Conductor	0	16
Unrecorded (water, hole full, 30')	16	200
Sand, Salt	200	240
Unrecorded (water, hole full, 380')	240	408
Sand, Salt (broken up sand shells)	408	500
Lime	600	675
Sand, pebbly	925	1065
Sand	1065	1085
Sand, Maxton	1190	1220
Big Lime	1225	1320
Slate	1320	1325
Sand, Big Injun (gas, 1332' and 1350')	1325	1364
Total depth		1366

8¼" casing, 200'; 6⅝" casing, 660'. "Well gauged 175 pounds in 2" tubing first minute; rock pressure, about 375 to 400 pounds."

The following well was abandoned as a dry hole, having only slight shows of gas:

Silica Sand Co. No. 4 Well Record (87).

Banks District; on the ridge 0.4 mile east of Craddock; authority, Greater Pittsburgh Oil & Gas Company; elevation, 2505' B.

	Thickness. Feet.	Total. Feet.
Soil	4	4
Sand	66	70
Slate	12	82
Sand, (water, 120')	61	143
Lime	53	196
Slate	52	248
Sand (water, 300')	59	307
Slate	99	406
Lime	77	483
Slate	54	537
Sand	157	694
Coal, Hughes Ferry?	1	695
Slate	28	723
Lime	41	764
Slate	45	809
Lime	34	843
Sand, Salt of Rosedale (slight show of oil, 850')	176	1019
Lime	41	1060
Red rock	368	1428
Lime	12	1440
Sand, Maxton (slight show of oil and gas, 1447')	17	1457
Slate	58	1515
Sand	43	1558
Slate	8	1566
Big Lime	120	1686
Unrecorded	100	1786
Red rock	6	1792
Sand, Big Injun (break of red rock, 1800-1803'; slight show of gas, 1810')	38	1820

Conductor, 8'; 8" casing, 730'; 6" casing, 1570'; 5" casing, 1794'.

The following well, which was estimated at 10 million feet daily capacity when drilled, blew wide open for 36 days before being capped. Its rock pressure in 1908 was 325 pounds. It still makes a small amount of gas, but about one-half barrel of water daily has to be pumped from the producing sand:

Silica Sand Co. No. 2 Well Record (88).

Banks District; on Buckhannon River, 0.2 mile north of Craddock; authority, Greater Pittsburgh Oil & Gas Company; completed, October 29, 1905; elevation, 2035' B.

	Top. Feet.	Bottom. Feet.
Unrecorded (water, 45-150')	0	300
Sand	300	325
Sand	413	447
Coal, Sewell (water)	470	475
Limestone	490	550
Sand	550	600
Red rock	600	890
Sand	890	910
Sand	945	970
Big Lime	979	1300
Slate and shells	1300	1309
Sand, Big Injun, (break of slate, 1315-1317'; gas, steel-line measure, 1328')	1309	
Total depth		1350

Drilled pocket to 1418'; 10" casing, 23'; 8¼" casing, 490'; 6⅝" casing, 1309'.

The following well made a light show of gas, but was abandoned as a dry hole:

Sherman Heirs No. 1 Well Record (89).

Banks District; on Buckhannon River, 0.5 mile northeast of Craddock; authority, Greater Pittsburgh Oil & Gas Company; completed, January 9, 1906; elevation, 2025' B.

	Thickness. Feet.	Total. Feet.
Unrecorded	40	40
Coal, Powellton (?)	3	43
Slate	37	80
Coal, Eagle	6	86
Lime	34	120
Sand, Salt	30	150
Lime	80	230
Slate	70	300
Lime	70	370
Slate	20	390
Coal, Sewell	6	396
Red rock	9	405
Sand	45	450
Lime	50	500
Red rock	80	580
Lime	20	600
Red rock	300	900
Lime	34	934
Sand	26	960

	Thickness. Feet.	Total. Feet.
Lime	55	1015
Sand	50	1065
Big Lime	235	1300
Sand, Big Injun (gas, 1322')	28	1328
Red rock	5	1333
Sand, Squaw	20	1353
Red rock	47	1400
Lime	20	1420
Red rock	30	1450
Lime	25	1475
Red rock	50	1525
Lime	20	1545
Red rock	30	1575
Lime to bottom	9	1584

10" casing, 36'; 8¼" casing, 405'; 6⅝" casing, 1300'. "Well would have made probably sufficient gas to run a boiler."

Prospective Oil and Gas Areas, Banks District.—The fact that the oil sands of Banks District occupy a monoclinal, or uniformly dipping position, indicates that their oil and gas contents are scattered rather than segregated into rich pools such as are found in regions where anticlines or synclines occur. It is possible, however, that extensions of the old fields may be made with profit, or new pools of value found. The following suggestions are made for further drilling: (1), The Frenchton Gas Field might be extended southwestward along the line of the 1900-foot structure contour in the direction of Frenchton and Big Knob. (2), The mixture of oil, gas, and water in the Salt Sand, found in many of the wells in the neighborhood of Bablin and Ingo, on the Little Kanawha River, indicates that wells drilled a short distance to the southeast along the rise of the rocks might avoid the water and find oil or gas pay. (3), The large amount of gas found in the Big Injun Sand at Craddock indicates that other wells might be found in the same horizon. Apparently the best hope would be on a line due west from the **Silica Sand Company No. 3 (84) Well,** which is the only direction where no dry holes have been found. (4), The wide expanse of country lying in the triangle bounded by Frenchton, Ingo, and Craddock, has not been tested in any manner, and it is reasonable to believe that some of it may prove to hold gas in commercial quantity. Unfortunately the structure, being monoclinal, offers little clue and drilling must be done by chance.

WELL RECORDS AND PROSPECTIVE AREAS, WESTERN PORTION OF RANDOLPH COUNTY.

EARLY HISTORY.

Only four wells have been drilled for oil and gas in western Randolph, all of which have been commercial failures. Of these, two were drilled east of Rich Mountain, in the Tygart Valley region, and, owing to the great anticline that passes through Elkins and Beverly, start at a stratigraphic level far below any producing oil or gas sand of the State and have little value as tests since they did not go deep enough to reach the lower sands of the Devonian and Silurian that produce in Ohio and Indiana. The other two wells were drilled west of Rich Mountain and therefore penetrated many of the West Virginia sands, but were dry holes, one having a show of oil in the Speechley Sand.

SUMMARIZED RECORDS, WESTERN PORTION OF RANDOLPH COUNTY.

The following is a tabulated list of the wells of western Randolph. The same general explanations given in connection with the table of wells in Barbour, page 312, apply here. The following abbreviations of company names are used:

Buckhannon Chem	Buckhannon Chemical Company.
Hope	Hope Natural Gas Company.
Mead et al	E. A. Mead and others.
T. V. Oil	Tygart Valley Oil Company.

Summarized Record of Tests for Oil and Gas in Western Portion of Randolph County.

No. on Map.	Farm Name and Number.	Magisterial District.	Owner.	Elevation.	Lower Kittanning Coal. Depth. Top.	Lower Kittanning Coal. Thickness. Feet.	Big Lime. Top.	Big Injun Sand. Top.	Berea Sand. Top.	Gordon Sand. Top.	Fifth Sand. Top.	Total Depth.	Producing Sand and Remarks.	
90	Buckhannon Chemical Co. No. 1......	Middle Fork........	Buckhannon Chem...	1905L	....	....	835	880	....	....	....	1481	Dry hole....................	90
90A	Mayton Lumber Co. No. 4903.......	Middle Fork........	Hope	2265B	....	....	1281	1341	....	....	2155	4949	Speechley, oil show..........	90A
91	Alonzo W. Murphy No. 1............	New Interest........	Mead et al.........	1995B	....	....	....	....	....	....	....	2385	Gas show....................	91
92	P. C. Daniels No. 1.................	Beverly	T. V. Oil..........	1990B	....	....	....	....	....	....	....	....	Gas show....................	92

DETAILED WELL RECORDS AND PROSPECTIVE AREAS, LEADSVILLE DISTRICT, RANDOLPH.

Leadsville District lies in the northern part of the county, next to Barbour. No wells have been drilled within its area, but the western part laps across the Belington Syncline, a geologic feature that offers considerable structural relief. That portion of the District west of the Laurel Ridge is covered with the coal measures and must therefore contain many o the underlying oil and gas horizons, making the presence o oil and gas possible. It is doubtful, however, in view of the fact that this territory is very close to the upturned and exposed edges of the strata along the east side of the mountain, whether drilling for oil or gas would be advisable.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS, ROARING CREEK DISTRICT, RANDOLPH.

Roaring Creek District lies in the northwestern corner of the County, next to Barbour and Upshur, and is wholly covered by the Pennsylvanian rocks and should therefore have the underlying West Virginia sands. No wells have been drilled for oil or gas. The Belington Syncline and the Hiram Anticline pass southward across the District, affording ideal structural relief, but since the oil sands crop along the eastern slope of Rich Mountain, it is doubtful whether oil or gas would be found in Roaring Creek District.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS, MIDDLE FORK DISTRICT, RANDOLPH.

Middle Fork District lies in the extreme western part of Randolph next to Upshur and Webster. Only two tests for oil and gas have been drilled in the District. One of these is the **Buckhannon Chemical Company No. 1 (90) Well,** drilled by this company on its own land at Newlon on the Buckhannon River, in the summer of 1913. The detailed record of this well, published as a part of the Newlon Section, page 155, shows neither oil nor gas, although the well was drilled to a depth of 1481 feet, and passed through many of the sands. The other test is a deep hole drilled subsequent to the completion of field work in the County. Only a light show of oil was found in what appears to be the Speechley Sand, the record of which follows:

Mayton Lumber Co. No. 4903 Well Record (90A).

Middle Fork District; on Buckhannon River at Arvondale Junction; authority, Hope Natural Gas Company; completed, November 30, 1917; elevation, 2265′ B.

	Top. Feet.	Bottom. Feet.
Sand, hard (water, 94′)	0	150
Lime, white, hard	150	157
Sand, white, hard (10″ casing, 170′)	157	170
Sand, dark, hard	170	190
Sand, white, hard (water, 210′)	190	350
Slate, black	350	460
Slate, dark	460	470
Sand, gray, Rosedale Salt	470	610
Slate	610	630
Gritty lime (8¼″ casing, 670′)	630	685
Sand, gray, Maxton	685	700
Slate, gray	700	750
Lime, gray	750	790
Slate, light	790	820
Lime, light	820	860
Gray —— ?	860	900
Red rock	900	
Lime, white	1090	1110
Sand	1110	1154
Slate and shells	1154	1232
Sand	1232	1246
Slate	1246	1258
Lime	1258	1268
Slate and shells	1268	1281
Big Lime	1281	1341
Big Injun Sand	1341	1402
Sand, gray (6⅝″ casing, 2081′), Fourth	2075	2091
Slate and shells	2091	2155
Sand, gray, Fifth	2155	2163
Slate and shells	2163	2395
Lime, white	2395	2475
Sand, white, Warren First?	2475	2525
Slate and shells	2525	3383
Sand, gray, Speechley (oil at 3393′)	3383	3410
Slate	3410	3735
Sand, dark-gray	3748	3754
Slate and shells	3754	3768
Sand, gray, Sheffield?	3768	3782
Slate and shells	3782	4000
Slate, soft, black	4000	4275

	Top. Feet.	Bottom. Feet.
Lime, gritty	4275	4310
Slate and shells	4310	4390
Slate	4390	4630
Slate and shells	4630	4925
Total depth		4949

"Plugged and abandoned".

The Hiram Anticline and the Belington Syncline traverse the District, affording good structural relief, and the area is all capped by the Pennsylvanian, assuring the presence of the oil sands below, but it is questionable whether drilling would be advisable in much of the District since the sands outcrop on the east side of Rich Mountain. The gas found in the Craddock Field of Upshur County, near the Randolph Line, would indicate that there might be a possible eastward extension of the pay streak up the structural slope into Middle Fork District.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS,

HUTTONSVILLE DISTRICT, RANDOLPH.

Huttonsville District lies southeast of Middle Fork and is almost entirely outside of the basin that holds the Pennsylvanian rocks and the oil sands, there being only a small area of these rocks along the head of Mill Creek. No tests have been drilled and it would seem that the chances for oil in any of the West Virginia sands would be almost hopeless. Whether deep production in the Ohio sands could be found in the region east of Rich Mountain is not germane to this Report.

DETAILED WELL RECORDS AND PROSPECTIVE AREAS,

MINGO DISTRICT, RANDOLPH.

Mingo District lies south of Middle Fork and is partly covered by the Pennsylvanian. The southeastern portion lies along the headwaters of Elk and Tygart Valley Rivers, where many of the oil sands crop above drainage. No tests have been drilled in the District, and it is doubtful whether drilling would be justified in the small area where the oil sands are probably present.

DETAILED WELL RECORDS, BEVERLY DISTRICT, RANDOLPH.

Beverly District lies along the Tygart Valley River east of Rich Mountain and is therefore outside of the region where the oil sands of West Virginia may be found. About the year 1903, the **P. C. Daniels No. 1 (92) Well** was drilled by the Tygart Valley Oil Company, on Files Creek, 1.3 miles southeast of Beverly. This well starts somewhere near the base of the Chemung Series, and, according to Mr. Daniels, was drilled to a depth of 1900 to 2000 feet, some light shows of gas being found. In the year 1910 the collected gas blew off the top of the conductor and a little gas still shows at the top of the casing.

DETAILED WELL RECORDS, NEW INTEREST DISTRICT, RANDOLPH.

New Interest District lies north of Leadsville and east of the Laurel Ridge and therefore covers a portion of the great anticline that passes through Elkins. The **Alonzo W. Murphy No. 1 (91)**, located on Saltlick Run of Leading Creek, one-half mile southwest of Montrose, was drilled on the crest of this arch, starting near the base of the Chemung Series. According to Mr. E. A. Mead, of Parkersburg, West Virginia, one of the interested parties, the detailed record has been lost, but he gives the following statement from memory:

> "The formation was a bastard lime to about 600 feet, then brown shale to about 1850 feet, then brown shale and shells to 2385 feet, the total depth. The whole formation was on a slope. We got crooked holes every time we got a shell and had to drill from 1850 feet to the finish with a long star bit in order to get along at all."

According to Mr. Murphy, a large amount of alum (?) water was encountered, but no salt water, and there was one small pocket of gas that blew for one hour strong enough that the fire under the boiler was extinguished for safety.

CHAPTER XI.

COAL.

In Chapters V to VIII, inclusive, a systematic description of all the coal seams found in the territory of this Report has been given, together with type sections and correlations. Some of the smaller beds that are not of commercial importance have been fully described. In the present Chapter, numerous actual measured sections will be published for those coals that are of minable thickness and purity, and estimates of their probable tonnage, with etchings showing their areal extent, will be given. At the end of the Chapter, there is a table of analyses, showing the chemical composition of all coals tested.

STATISTICS OF COAL PRODUCTION.

Commercial coal mining has long been an established industry in Barbour and the western portion of Randolph, where many large and well-equipped plants are delivering to the markets a heavy annual tonnage. In Barbour the Redstone, Pittsburgh, Clarion, and Lower Kittanning seams are being mined, but in Randolph, where the coals of the Monongahela Series belong above the hilltops, mining has been carried on in the Lower Kittanning, Clarion, and Sewell Coals, the Clarion not being at present mined. In Upshur only a few commercial mining plants have been built, with production in the Redstone, Elk Lick, Upper Freeport, and Lower Kittanning Coals. There are three shaft mines in western Barbour, two of which have been abandoned. All of the others in the three counties are of the slope or drift variety, mining directly on the seams. Coke is produced in all three counties, Randolph being far in the lead of the other two.

The following table, assembled from statistics given in the Annual Reports of the West Virginia Department of Mines, Earl A. Henry, Chief, for 1914 and 1915, gives the coal and coke production of the three counties for the past decade:

Coal and Coke Production of Barbour, Upshur, and Randolph Counties from 1906 to 1915, Inclusive.

YEAR.	Barbour County.		Upshur County.		Randolph County	
	Coal. Long Tons.	Coke. Short Tons.	Coal. Long Tons.	Coke. Short Tons.	Coal. Long Tons.	Coke. Short Tons.
1906	638,253	17,643	5,809	....	509,443	231,616
1907	776,245	34,030	39,502	2,100	609,380	244,054
1908	829,046	44,359	76,773	4,010	545,803	129,273
1909	735,033	27,203	60,589	....	463,206	128,401
1910	895,427	31,898	70,396	....	700,290	183,405
1911	792,268	19,776	56,189	....	788,662	130,694
1912	756,395	1,475	37,091	....	716,632	119,513
1913	964,627	16,005	59,077	10,626	741,567	179,919
1914	1,098,495	25,352	97,473	10,560	737,718	152,280
1915	962,228	16,128	98,504	2,274	550,108	67,381
Totals	8,448,017	233,869	691,403	29,570	6,362,809	1,566,536

The **Coal Production** of Barbour, Upshur, and Randolph Counties for the years 1916 and 1917 is reported as follows:

	1916 Long Tons.	1917 Long Tons.
Barbour County........................	1,096,358	1,306,983
Upshur County........................	140,013	146,762
Randolph County......................	784,556	708,638

In the **order of production of coal by counties,** Barbour ranked 12th from 1908 to 1914, inclusive, and 13th in 1915; Upshur ranked 31st in 1912, 29th in 1913, 27th in 1914, and 28th in 1915; Randolph ranked 14th in 1912 and 1913, 15th in 1914, and 18th in 1915.

Production of Coal and Coke, by Mines, in Barbour, Randolph, and Upshur Counties, for the Year Ending June 30, 1914.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2,240 lbs.			Distribution of Coal. (Tons of 2,240 lbs.				Production of Coke. (Tons of 2,000 lbs.)			Railroad Located on.
		First Six Months.	Second Six Months.	Total Coal Produced During Year.	Used in Operation of Mine.	Furnished Local Trade & Tenants.	Used in Coke Ovens.	Quantity Shipped from Mines.	First Six Months.	Second Six Months.	Total Coke Production for Year.	
BARBOUR COUNTY.												
Century Coal Co., The	No. 1	148,514	158,793	307,307	6,000	936	......	300,371	......	......	......	B. & O.
Century Coal Co., The	No. 2	37,374	44,601	81,975	......	76	......	81,899	......	......	......	B. & O.
Consolidation Coal Co., The	No. 37	101,449	82.298	183,747	4,709	877	......	178,161	......	......	......	B. & O.
Crawford Coal Co., The	Adma	1,235	......	1,235	......	......	......	1,235	......	......	......	B. & O.
Davis Coal & Coke Co.	Dartmoor No. 4	77,339	72,034	149,373	1,298	255	......	147,820	......	......	......	W. Md.
Davis Coal & Coke Co.	Weaver No. 3	19,597	8,461	28,058	169	......	......	27,889	......	......	......	W. Md.
Davis Colliery Co.	Junior No. 4	29,982	33,173	63,155	928	429	20,043	41,755	7,300	8,408	15,708	W. Md.
Gage Coal & Coke Co.	Sara	13,063	9,101	22,164	590	393	13,177	8,004	4,203	5,441	9,644	W. Md.
Grafton Fuel Co.	Lillian No. 1	19,451	20,151	39,602	510	106	......	38,386	......	......	......	B. & O.
Green, W. H.	Williette	10 000	10,000	20,000	......	......	......	20,000	......	......	......	W. Md.
Humphrey's Coal Co.	No. 1	24,722	20,221	44,943	665	511	......	43,767	......	......	......	B. & O.
Laurel Creek Coal Co.	Laurel Creek	5,710	5,193	10,903	......	......	......	10.903	......	......	......	B. & O.
Luella Coal & Coke Co.	Luella	20,430	18,430	38,860	200	100	......	38,560	......	......	......	B. & O.
Sandridge, Lee J.	Meriden No. 1	41,277	23,291	64,568	4,930	1,360	......	58,278	......	......	......	B. & O.
Tygarts River Coal Co.	Arden	22,901	19,704	42,605	1,801	295	......	40,509	......	......	......	B. & O.
Totals		573.044	525,451	1,098,495	21,800	5,338	33,220	1,038,137	11,503	13,849	25,352	
RANDOLPH COUNTY.												
Davis Coal & Coke Co.	Weaver No. 1	42,282	32,543	74,825	1,426	864	......	72,535	......	......	......	W. Md.
Davis Coal & Coke Co.	Weaver No. 2	72 597	54,355	126,952	650	30	......	126 272	......	......	......	W. Md.
Davis Colliery Co.	Coalton Nos. 1 and 3	121,609	108,643	230,252	6,098	1,222	143,635	79,297	64,439	48,129	112,568	C. & C.
Davis Colliery Co.	Sivad No. 2	30,202	22,602	52,804	144	......	......	52,660	......	......	......	C. & C.
Davis Colliery Co.	Sivad No. 5	8,292	9,788	18,080	......	154	......	17,926	......	......	......	C. & C.
Davis Colliery Co.	Harding Nos. 1, 3 and 5	62,711	56,217	118,928	2,366	707	50,672	65,153	19,784	19,928	39,712	W. Md.
Green Coal Co., W. H.	Leroy No. 1	1,000	......	1,000	......	......	......	1,000	......	......	......	C. & C.
Humphreys, A. M., rec. Brady Coal Co.	Klondyke	15,044	9,764	24,808	......	224	......	24,584	......	......	......	C. & C.
Jenkins Coal & Coke Co., J. B.	Ariana	20.000	40,000	60,000	50	200	......	59,750	......	......	......	C. & C.
Rich Mountain Coal Co.	Hartridge	4,160	1,845	6,005	318	129	......	5 558	......	......	......	B. & O.
Rich Mountain Coal Co.	Beech Creek	3,688	1,543	5,231	90	170	......	4,971	......	......	......	B. & O.
W. Va. Pulp & Paper Co.	Hopkins	7,855	10,978	18,833	125	......	......	18,708	......	......	......	C. & C.
Totals		389,440	348,278	737,719	11,267	3,700	194,307	528,444	84,223	68,057	152,280	
UPSHUR COUNTY.												
Buckhannon River C. & C. Co.	Florence No. 2	19,915	31,883	51,798	400	865	13,200	37,833	5,280	5,280	10,560	C. & C.
Newcomer Coal Co.	Newcomer	1,437	2,824	4,261	......	......	......	4.261	......	......	......	B. & O.
Red Rock Fuel Co.	Red Rock	21,125	20,289	41,414	954	686	......	39,774	......	......	......	B. & O.
Totals		42,477	54,996	97,473	1,354	1,051	13,200	81,868	5,280	5,280	10,560	

Production of Coal and Coke, by Mines, in Barbour, Randolph, and Upshur Counties for the Year Ending June 30, 1915.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2,240 lbs.)			Distribution of Coal. (Tons of 2,000 lbs.)				Production of Coke. (Tons of 2,000 lbs.)			Railroad Located on.
		First Six Months.	Second Six Months.	Total Coal Produced During Year.	Used in Operation of Mine.	Furnished Local Trade & Tenants.	Used in Coke Ovens.	Quantity Shipped from Mines.	First Six Months.	Second Six Months.	Total Coke Production for Year.	
BARBOUR COUNTY.												
Boat Run Coal Co.	Boat Run No. 1	......	8 200	8,200	480	10	......	7,710	......	......	......	B. & O.
Century Coal Co., The	No. 1	157,758	142,707	300,460	6,000	1,050	......	293,410	......	......	......	B. & O.
Century Coal Co., The	No. 2	39,706	70,766	110,472	......	163	......	110,309	......	......	......	B. & O.
Consolidation Coal Co., The	No. 37	97,525	111,299	208,824	4,755	859	......	203,210	......	......	......	B. & O.
Crawford, H. M.	Adma	......	......	......	......	......	......	......	......	......	......	......
Davis Coal & Coke Co.	Dartmoor No. 4	60,182	84,022	144,204	1,161	239	......	142,804	......	......	......	W. Md.
Davis Colliery Co.	No. 4	15,598	......	15,598	296	135	3,928	11,239	3,079	......	3,079	W. Md.
Empire Coal Mining Co.	Empire	......	......	......	......	......	......	......	......	......	......	......
Gage Coal & Coke Co.	Sara	7,920	12,646	20,566	685	536	17,449	1,896	4,551	8,498	13,049	W. Md.
Grafton Fuel Co.	Lillian	24,636	21.670	46,306	774	100	......	45,432	......	......	......	B. & O.
Humphrey's Coal Co.	Humphreys	26,610	18,348	44,958	1,103	397	......	43,458	......	......	......	B. & O.
Luella Coal & Coke Co.	Luella	21,450	11,320	32,770	......	100	......	32,670	......	......	......	B. & O.
Sandridge, Lee J., Coal Co.	Meriden Nos. 1 and 2	20,490	9,380	29,870	2,625	1,155	......	26,090	......	......	......	B. & O.
Totals	......	471,870	490,358	962,223	17,879	4,744	21,377	918,228	7,630	8,498	16,128	
RANDOLPH COUNTY.												
Brady Coal Co.	Klondyke	8,248	3,112	11,360	......	110	......	11,250	......	......	......	C. & C.
Davis Coal & Coke Co.	Weaver No. 1	30,489	24,937	55.426	1 055	559	......	53,812	......	......	......	W. Md.
Davis Coal & Coke Co.	Weaver No. 2	39,131	50,602	89,733	518	......	......	89,215	......	......	......	W. Md.
Davis Colliery Co.	Coalton	89,816	71,702	161,518	5,584	1,114	57,055	97,765	24,416	20,299	44,715	C. & C.
Davis Colliery Co.	Harding	57,351	53,087	110,438	2,318	624	28,922	78,574	9,333	13,333	22,666	W. Md.
Davis Colliery Co.	Sivad No. 2	19,219	4,056	23,275	84	24	......	23,167	......	......	......	C. & C.
Davis Colliery Co.	Coaling Station	8,492	6,916	15.408	......	146	......	15,262	......	......	......	C. & C.
Green, W. H.	Williette	15,000	10.000	25,000	......	......	......	25,000	......	......	......	W. Md.
Jenkins Coal & Coke Co., J. B.	Ariana	22,425	12,110	34,535	288	298	......	33,949	......	......	......	C. & C.
W. Va. Pulp & Paper Co.	Hopkins	12,985	10,430	23,415	42	......	......	23 373	......	......	......	G. C. & E.
Totals	......	303,156	246,952	550,108	9,889	2,875	85,977	451,367	33,749	33,632	67,381	
UPSHUR COUNTY.												
Buckhannon River C. & C. Co.	Florence No. 2	32,020	13,602	45,622	400	400	3,792	41,030	1,000	1,274	2,274	C. & C.
Red Rock Fuel Co.	Red Rock	28,235	24,647	52,882	1,240	604	......	51,038	......	......	......	B. & O.
Totals	......	60,255	38,249	98,504	1,640	1,004	3,792	92,068	1,000	1,274	2,274	

In the above tables of statistics, two mines are included which are located in the eastern coal basin of Randolph County, and therefore outside the limits of this Report.

In Barbour, Upshur, and western Randolph, there are 19 coals that appear to have minable thickness and 18 others too thin, impure, or irregular to be of more than local value. The minable coals in descending order are the Redstone and Pittsburgh of the Monongahela Series; the Elk Lick and Bakerstown of the Conemaugh Series; the Upper Freeport, Upper Kittanning, Middle and Lower Kittanning (often too close together to be mined as separate beds), and Clarion of the Allegheny Series; Upper Mercer, Lower Mercer, Quakertown, Campbell Creek, Powellton, Eagle, and Gilbert of the Kanawha Group of the Pottsville Series; Hughes Ferry, Castle, Sewell, and Welch of the New River Group of the Pottsville Series.

Figure 3 shows the different coal seams of the territory of this Report, giving not only their relative thickness, but also the maximum interval between them. Figures 4 to 20, inclusive, published in the present Chapter, will show, approximately, where each of the commercial seams occurs in possible minable thickness.

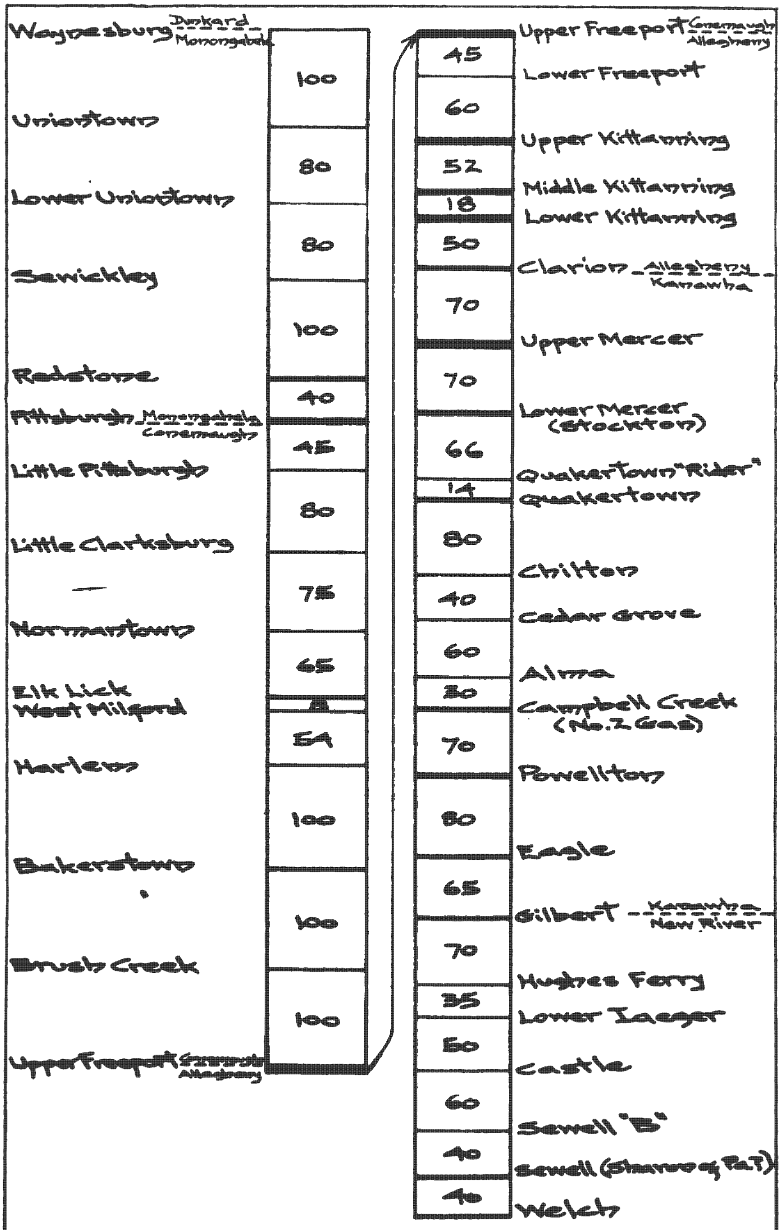

Figure 3.—Diagram Showing Relative Position of Coal Seams.

RECORDS OF COAL TEST BORINGS, BARBOUR COUNTY.

SUMMARIZED RECORDS.

In Barbour 76 tests for coal have been bored, all of which were visited in the field in order to secure the accurate location and surface level. Besides these tests 5 others have been made in adjoining regions of Taylor and Preston that bear directly on the coal resources of Barbour. An attempt was made to secure the records of these 81 borings but owing to the inability or unwillingness of some of the operators who made them, only part of them have been obtained. The following table, while lacking some of the details that it should contain, gives the surface elevations and ownership of all the borings and the condensed records of such as were secured. The first column gives the key number on Map II, by which the position of the borings may be found, and in the elevation column the letter "L" signifies a hand-level determination, and "B" indicates that the aneroid barometer was used, checked on the nearest government elevation. The following abbreviations of company names have been used:

Baton & Co	George S. Baton and Company.
Beckwith & Co	G. S. Beckwith and Company.
Clements C. & C.	Clements Coal and Coke Company.
Consolidation	Consolidation Coal Company.
Davis C. & C.	Davis Coal and Coke Company.
Mohawk	Mohawk Smokeless Coal Company.
Robinson et al	J. F. Robinson and others.
Talbott et al	R. E. Talbott and others.
Valley C. & C.	Valley Coal and Coke Company.

Summarized Record of Tests for Coal in Barbour County.

No. on Map II.	Name of Property.	Magisterial District.	Company.	Elevation Above Tide.	Pittsburgh Coal.		Upper Freeport Coal.		Upper Kittanning Coal		Middle Kittanning Coal		Lower Kittanning Coal		Total Depth.	No. on Map II.
					Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.		
1	Consolidation Coal Co. No. 1	Pleasant	Consolidation	1580B												1
2	Consolidation Coal Co. No. 2	Elk	Consolidation	1600B												2
3	Robert Wood No. 1	Elk	Talbott et al.	1086L												3
4	Geo. W. Post No. 2	Union	Talbott et al.	1430B			232	4.4								4
5	Geo. W. Post No. 1	Union	Talbott et al.	1415B												5
6	Wm. M. Ross No. 1	Union	Talbott et al.	1407L												6
7	H. N. Rohr Heirs No. 1	Union	Talbott et al.	1375B												7
8	W. E. Haller No. 3	Union	Beckwith & Co.	1630B												8
9	W. E. Haller No. 1	Union	Beckwith & Co.	1585B												9
10	W. E. Haller No. 2	Union	Beckwith & Co.	1500B												10
11	Abe McDonald No. 1	Philippi	Talbott et al.	1385B												11
12	Freeport Smokeless Coal Co. No. 1	Philippi	Freeport Smokeless	1313L												12
13	Daniel Diamond No. 1	Philippi	Freeport Smokeless	1705B												13
14	J. S. Thacker No. 1	Philippi	Freeport Smokeless	1750B												14
15	Brown Burner No. 1	Philippi	South Penn Coal	1682L												15
16	D. M. Boylen No. 1	Philippi	South Penn Coal	1755B												16
17	Hall Coal Co. No. 1	Philippi	Hall Coal Co.	1310B											139	17
18	Nelson Newman No. 1	Philippi	Hall Coal Co.	1300B									15		115	18
19	Boat Run Coal Co. No. 1	Philippi	Boat Run Coal Co.	1312L											104.5	19
20	Martin Nicola No. 1	Cove	Hess Poling	1325B											40	20
21	Jasper England No. 1	Cove	Hess Poling	1455B									95	3	125	21
22	Jasper England No. 2	Cove	Hess Poling	1544B			40	4							60	22
23	E. H. Bennett No. 4	Knottsville (Taylor)	Mohawk	1008L												23
24	E. H. Bennett No. 2	Knottsville (Taylor)	Mohawk	1022L					90	2	120.4	1	133.5	6	139.7	24
25	E. E. McDaniel No. 3	Knottsville (Taylor)	Mohawk	1105B			28	1.2							144	25
26	Jas. M. Hamilton	Reno (Preston)	J. M. Guffey	1314L			49.5	5.3					272	3	281	26
27	Jas. M. Hamilton	Reno (Preston)	J. M. Guffey	1325L			40.7	5.7							46.7	27
28	Jas. M. Hamilton	Cove	J. M. Guffey	1309L												28
29	James Lindsay No. 1	Cove	J. M. Guffey	1365B			143	2.6	235.5	2.5			318.4	1.2	428	29
30	Allie Rosier No. 1	Cove	J. M. Guffey	1435B			186.8	8.2	287	2.5					293.5	30
31	James Poling No. 1	Cove	Baton & Co.	1530B												31
32	Charles Nestor No. 1	Cove	J. M. Guffey	1460B							205	0	227.2	5	234.7	32
33	Lewis Auvill No. 1	Cove	J. M. Guffey	1425B					113.3	1.7	183.5	0.9	205	2.9	229.1	33
34	S. B. Stalnaker No. 1	Cove	Baton & Co.	1470B												34
35	E. P. Moore No. 1	Glade	South Penn Coal	1580B			69	4.7	219	1.7	249	1.6	281.9	5.6	295	35
36	Regina A. Stalnaker No. 1	Glade	Baton & Co.	1580B												36
37	Nelson H. Harris No. 1	Glade	South Penn Coal	1571L					204.6	8.2	218	3.9	262	2.2	284	37
38	Jas. O. Boyles No. 1	Glade	South Penn Coal	1565B												38
39	Isaac Coonts Heirs No. 1	Glade	South Penn Coal	1575B			93	3.9	229	1.4	274.3	1.5	291.2	5.9	306.1	39
40	Jackson Coonts No. 1	Barker	Baton & Co.	1620B												40
41	Solomon Wilson No. 1	Barker	Baton & Co.	1625B												41
42	Frank Shockey Heirs	Barker	Clements C. & C. (?)	1905B												42
43	Frank Shockey Heirs	Barker	Clements C. & C. (?)	1910B												43
44	Clements Coal & Coke Co.	Barker	Clements C. & C.	1604L												44

Summarized Record of Tests of Coal in Barbour County (Continued).

No. on Map II.	Name of Property.	Magisterial District.	Company.	Elevation Above Tide.	Pittsburgh Coal.		Upper Freeport Coal.		Upper Kittanning Coal		Middle Kittanning Coal		Lower Kittanning Coal		Total Depth.	No. on Map II.
					Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness Feet.	Depth. Top.	Thickness. Feet.		
45	Braxon Durett No. 1	Barker	Valley C. & C.	1745B	....	....	....	....	....	....	....	....	....	....	....	45
46	Scott Davis No. 1	Barker	Davis C. & C.	1710B	....	....	....	....	....	....	....	....	....	....	....	46
47	T. T. Elliott No. 1	Barker	Robinson et al.	1705B	....	....	69.5	6	....	....	....	....	....	....	200	47
47A	Belington Industrial Co. No. 1	Barker	Belington Industrial.	1735B	....	....	....	....	....	....	....	....	....	....	....	47A
48	Bradford Robinson No. 1	Barker	Baton & Co.	1735B	....	....	....	....	....	....	....	....	....	....	....	48
48A	Belington Industrial Co. No. 2	Barker	Belington Industrial.	1775B	....	....	....	....	....	....	....	....	....	....	....	48A
49	Floyd Hillyard No. 2	Barker	Davis C. & C.	1880B	....	....	....	....	....	....	....	....	....	....	....	49
50	Floyd Hillyard No. 1	Barker	Davis C. & C.	1950L	....	....	....	....	....	....	....	....	....	....	....	50
51	Floyd Hillyard No. 3	Barker	Davis C. & C.	1840B	....	....	....	....	....	....	....	....	....	....	....	51
52	Davis Coal & Coke Co. No. 5	Barker	Davis C. & C.	1835B	....	....	....	....	....	....	177.3	7.6	189.2	6.6	197	52
53	Davis Coal & Coke Co. No. 1	Barker	Davis C. & C.	2050B	....	....	....	....	....	....	206.8	2.5	212.1	5	222	53
54	Davis Coal & Coke Co. (Wm. Phillips) No. 2	Barker	Davis C. & C.	2085B	....	....	....	....	....	....	197.2	3.9	206.3	4.7	212	54
55	Chas. R. Stipe No. 1	Barker	Davis C. & C.	1970B	....	....	....	....	....	....	....	....	....	....	....	55
56	Davis Coal & Coke Co. (Wm. J. Phillips) No. 3	Barker	Davis C. & C.	2050B	....	....	....	....	....	....	93.1	5.4	100.8	3	107	56
57	Davis Coal & Coke Co. (E. B. Ryan) No. 4	Barker	Davis C. & C.	2175B	....	....	29.8	....	....	....	204.8	2.5	209.2	3.2	215	57
58	Valley Coal & Coke Co.	Valley	Valley C. & C.	1750B	....	....	....	....	....	....	....	....	....	....	....	58
58A	Valley Coal & Coke Co.	Valley	Valley C. & C.	1815B	....	....	....	....	....	....	....	....	....	....	....	58A
59	Valley Coal & Coke Co.	Valley	Valley C. & C.	1831L	....	....	....	....	....	....	....	....	....	....	....	59
59A	Valley Coal & Coke Co.	Valley	Valley C. & C.	1800B	....	....	....	....	....	....	....	....	....	....	....	59A
60	Alonzo Stalnaker No. 1	Valley	Valley C. & C.	1870B	....	....	....	....	....	....	....	....	....	....	....	60
61	J. A. Gaunt No. 1	Valley	Valley C. & C.	1965B	....	....	....	....	....	....	....	....	....	....	....	61
62	Valley Coal & Coke Co.	Valley	Valley C. & C.	....	....	....	....	....	....	....	....	....	....	....	....	62
62A	Valley Coal & Coke Co.	Valley	Valley C. & C.	1659L	....	....	....	....	....	....	....	....	....	....	....	62A
63	A. W. Helwig No. 6	Valley	Valley C. & C.	1925L	....	....	....	....	....	....	52.9	1	65	6	74	63
64	Taylor George No. 1	Valley	Valley C. & C.	1970B	....	....	....	....	....	....	....	....	....	....	....	64
64A	A. V. Wilmoth No. 5	Valley	Valley C. & C.	2160L	....	....	56	8	114.5	5.4	208.5	0.5	219.7	5.5	226.5	64A
65	Joseph Teter Heirs	Valley	Valley C. & C.	2150B	....	....	....	....	....	....	....	....	....	....	....	65
66	Joseph Teter Heirs (W. D. Westfall)	Valley	Valley C. & C.	1485B	....	....	....	....	....	....	....	....	....	....	....	66
67	Joseph Teter Heirs	Valley	Valley C. & C.	1810B	....	....	....	....	....	....	....	....	....	....	....	67
68	Robt. Tallman No. 2	Valley	Valley C. & C.	1906L	....	....	....	....	....	....	154	4.5	162.5	7	169.5	68
68A	Wm. Yeager No. 1	Valley	Valley C. & C.	1720B	....	....	....	....	....	....	....	....	....	....	....	38A
69	Cora Wilson (Wm. Boner) No. 1	Valley	Valley C. & C.	1747L	....	....	....	....	....	....	62.8	4	73.1	7.2	80.6	69
70	Blackman Wilmoth No. 3	Valley	Valley C. & C.	2017L	....	....	....	....	184	6.3	....	....	243	6.2	279	70
71	Davis No. 1	Valley	Valley C. & C.	1945B	....	....	....	....	....	....	....	....	....	....	....	71
72	Henry Thorn No. 1	Valley	Valley C. & C.	1945B	....	....	....	....	....	....	....	....	....	....	....	72
73	John Gibson No. 4	Valley	Valley C. & C.	1919L	....	....	....	....	....	....	118	3.8	143.2	7.2	154	73
74	Myrtle Teter No. 1	Valley	Valley C. & C.	1883L	....	....	....	....	....	....	....	....	....	....	....	74
74A	E. C. McCauley No. 1	Valley	Valley C. & C.	1920B	....	....	....	....	....	....	....	....	....	....	....	74A

DETAILED COAL TEST RECORDS, PLEASANT DISTRICT, BARBOUR.

In Pleasant District one test has been drilled for coal, the **Consolidation Coal Company No. 1 (1) Boring,** located on the head of Foxgrape Run, 1 mile southwest of Berryburg. This test starts about 175 feet above the level of the Pittsburgh Coal but its detailed record could not be obtained.

DETAILED COAL TEST RECORDS, ELK DISTRICT, BARBOUR.

In Elk District two tests have been drilled for coal. The **Consolidation Coal Company No. 2 (2) Boring,** made on the head of Stewart Run, 1.5 miles southwest of Berryburg, starts at a level of about 175 feet above the Pittsburgh Coal. Its detailed record was not secured. The **Robert Wood No. 1 (3) Boring,** located on Elk Creek at Elk City, starts at a level of approximately 525 feet below the Pittsburgh Coal, and should therefore have been a test of the coals of the Allegheny Series, but its detailed record could not be obtained.

DETAILED COAL TEST RECORDS, UNION DISTRICT, BARBOUR.

The **George W. Post No. 2 (4) Boring,** located on First Big Run, 1 mile northwest of Malta, starts at an approximate level of 400 feet below the Pittsburgh Coal. According to Hon. R. E. Talbott, of Philippi, one of the interested parties, a coal seam was found at 231′ 7″ which was 4′ 4½″ thick with a 3″ bone parting. This bed apparently correlates with the Upper Freeport Coal. Another seam was found at 287′ 6″, being 5′ 9″ thick with 8″ of bone parting, and this is probably the Lower Freeport Coal, although the thickness seems excessive. Three other tests were made in Union District by the same parties, but their records could not be obtained. The **George W. Post No. 1 (5) Boring,** located on First Big Run, 0.9 mile northwest of Malta, starts at a level of about 435 feet below the Pittsburgh Coal. The **Wm. M. Ross No. 1 (6) Boring,** located on Big Run just northwest of Volga, starts at a level of about 370 feet below the Pittsburgh Coal. The **H. N. Rohr Heirs No. 1 (7) Boring,** located on the west side of

Tygart Valley River, 0.8 mile east of Volga, starts near the level of the Upper Freeport Coal.

East of the Tygart Valley River in the immediate vicinity of Carrolton, three tests were once made on the **W. E. Haller** farm by G. S. Beckwith and Company, of Cleveland, Ohio, but the records are not now available. The following quotation is made from Mr. Beckwith's letter concerning them:

> "We do not have the record of the holes drilled on the Haller place. My recollection is that in the first two holes (Nos. 9 and 10 on Map II), which were drilled near the brow of the hill, we encountered a broken condition, which gave us no record of consequence, and resulted, as I remember now, in the loss of our tools. In the last hole drilled (No. 8 on Map II), which was out behind the buildings, I think we encountered two seams of coal showing fair thickness. I do not remember at what depths these seams were reached or the thickness. We sold this property about six years ago and I have not been down there since. Mr. Lane, the engineer who had charge of the drilling, would have had the records of the holes, but he died in the West three or four years ago."

DETAILED COAL TEST RECORDS, PHILIPPI DISTRICT, BARBOUR.

In Philippi District nine holes have been bored for coal. The **Abe McDonald No. 1 (11),** located on a branch of Elk Creek, 1.4 miles southeast of Elk City, starts at an approximate level of 465 feet below the Pittsburgh Coal. The **Freeport Smokeless Coal Company No. 1 (12), Daniel Diamond No. 1 (13),** and **J. S. Thacker No. 1 (14),** located near Lillian, were bored by parties who owned the property prior to its acquisition by the Freeport Smokeless Coal Company. The records of the borings could not be located. The **Brown Burner No. 1 (15),** located on Little Laurel Run, 2 miles northwest of Calhoun, and the **D. M. Boylen No. 1 (16),** located on Big Laurel Run, 1.1 miles northeast of Mt. Liberty, start not far from the Upper Freeport Coal horizon and should have penetrated the Lower Kittanning, but their records could not be obtained.

Below Philippi two holes were drilled on the property of the Hall Coal Company, one located at Meriden and the other 0.6 mile northeast of Berryburg Junction. Concerning these borings, Mr. A. Thompson, of Philadelphia, one of the interested parties, says the following in his letter concerning them:

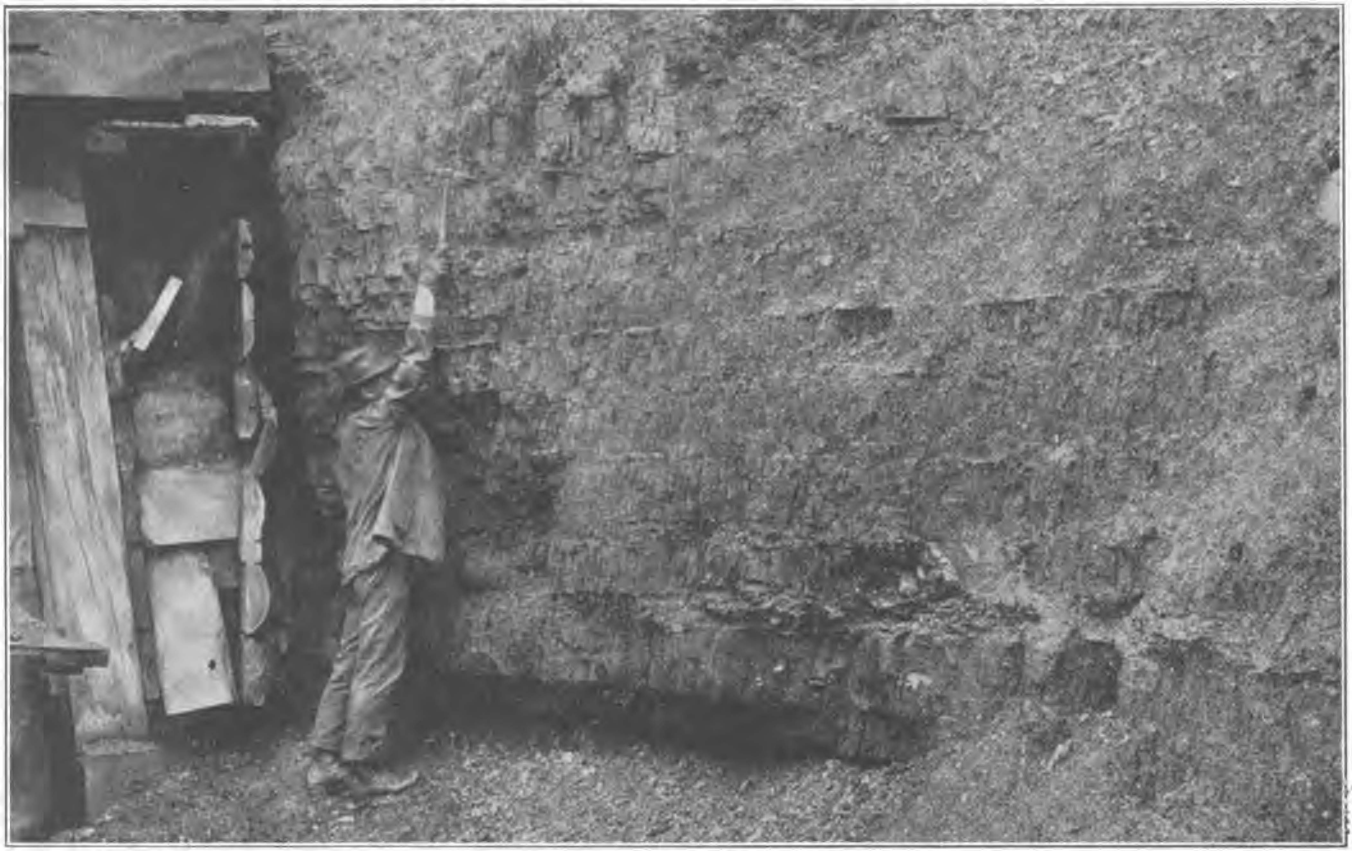

PLATE XXII.—Middle and Lower Kittanning Coal at Davis Colliery Company No. 1 Mine (Nos. 807 and 808 on Map IV), at Coalton; Point of hammer is inserted at top of coal.

> "These drillings were not sufficiently extensive to develop anything, so far as we are able to discover. The one located at Meriden (No. 17 on Map II), near the No. 1 tipple, was drilled only 139 feet. The one at the Nelson Newman farm (No. 18 on Map II) was drilled only 115 feet. There was nothing whatever cut in the way of coal measures by the drilling near the No. 1 tipple at Meriden. At the Newman farm the six-foot vein (Lower Kittanning, D. B. R.), which is the lower vein worked at Meriden, was cut twelve to fifteen feet below the surface. No other coal measures were developed by this drilling,—in fact, the only purpose in drilling this hole was to determine the depth below the surface of the six-foot vein at this point. Not one of the four men actively interested in the Hall Coal Company at the time this drilling was done is now living, and the coring procured at that time was not regarded of sufficient importance to preserve."

The record of the **Boat Run Coal Company No. 1 (19) Boring**, located at Arden, alongside the mine tipple, is published in the section for Arden, page 96. It was bored to a total depth of 104.5 feet, and penetrated the Upper Mercer Coal.

DETAILED COAL TEST RECORDS, COVE DISTRICT, BARBOUR.

In Cove District ten borings have been made for coal. Three holes were put down with a churn drill by Hess Poling, of Philippi, along the Tygart Valley River about one mile southwest of Moatsville, being located on the steep hillside east of the River. The **Martin Nicola No. 1 (20)** starts level with the Lower Kittanning Coal, and, according to Mr. Poling, was drilled to a depth of 40 feet when the bailer was lost, no coal being found. The **Jasper England No. 1 (21)** starts level with an old prospect in the Lower Freeport Coal and was drilled to a depth of 125 feet, finding 3 feet of coal at 95 feet, that would seem to correlate with the Lower Kittanning. The **Jasper England No. 2 (22)** starts above the Upper Freeport Coal and penetrated that seam at 40 feet, finding it 4 feet thick. The hole was 60 feet deep.

Three tests have been made for coal near Stonehouse, Knottsville District, Taylor County, less than two miles from the Barbour Line. The record of the **E. H. Bennett No. 4 (23)** was never obtained by the Survey, but that of the **E. H. Bennett No. 2 (24)** is published in the Monongalia-Marion-Taylor Report, page 158, and that of the **E. E. McDaniel No. 3 (25)** appears in the same volume, page 156.

Three tests have been made along Sandy Creek in the immediate vicinity of Dent, two of which are in Preston County. The records of these two holes, as previously published in the Preston Report, pages 252 and 253, are as follows:

James M. Hamilton Coal Test (26).

Reno District, Preston County; at Dent, on Sandy Creek; authority, J. M. Guffey; elevation, 1314′ L.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Sand and clay	15	0	15	0
Shale, sandy	10	0	25	0
Sandstone	10	0	35	0
Sand shale	14	5	49	5
Slate	0	1	49	6
Coal ....2′ 5″ Binder ......0 1 Coal ....2 2½ Binder ......0 2½ Coal, dirty...0 4½ } (Upper Freeport). (1258′ L.)	5	3½	54	9½
Slate	0	2½	55	0
Shale, dark	10	0	65	0
Light sand shale	30	0	95	0
Shale, sandy	15	0	110	0
Sandstone	7	0	117	0
Shale, hard, dark	5	0	122	0
Light sandy shale	25	0	147	0
Dark sand shale	14	0	161	0
Shale, sandy	14	0	175	0
Sandstone, East Lynn	77	7	252	7
Shale, dark	4	3½	256	10½
Sandstone, fine-grained	1	6	258	4½
Sandstone, hard, coarse	13	6½	271	11
Coal, Lower Kittanning	3	0½	274	11½
Dark, hard slate, shale to bottom	6	0½	281	0

James M. Hamilton Core Test (27).

Reno District, Preston County; at Dent, on Sandy Creek; authority, J. M. Guffey; elevation, 1325′ L.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Drift	12	0	12	0
Sandstone, sharp and fine, Lower Mahoning	27	0	39	0
Slate	1	9	40	9
Coal ....4′ 1″ Binder ....0 2 Coal ....1 5 } Upper Freeport.. (1284′ L.)	5	8	46	5
Fire clay	0	4	46	9

The record of the **James M. Hamilton (28) Boring,** located on the Barbour side of Sandy Creek at Dent, was never secured.

The record of the **James Lindsay No. 1 (29) Boring,** made on Sandy Creek, 1 mile northwest of Colebank, is published in connection with the section for Colebank, page 101. The following is the record of another hole in the same vicinity:

Allie Rosier Coal Test (30).

Cove District; on Sandy Creek, 0.2 mile west of Colebank; authority, J. M. Guffey; elevation, 1435′ B.

		Thickness.		Total.	
		Ft.	In.	Ft.	In.
Surface, soil, and loose shale.....10.5′ Conglomerate, with hard quartz pebbles............ 9.5 Conglomerate..... 4.0 Sandstone, coarse, broken 22.0	Buffalo Sandstone..	46	0	46	0
Shale, gray		6	0	52	0
Fire clay shale		11	0	63	0
Shale, soft, gray, mixed with lime.		20	0	83	0
Shale, sandy		9	0	92	0
Shale, gray, broken		8	6	100	6
Sand, Upper Mahoning		20	0	120	6
Shale, blue		0	10	121	4
Shale, dark		0	2	121	6
Shale, blue		0	6	122	0
Sandstone, coarse...14′ Conglomerate, hard. 5 Sandstone, hard, white, with dark shale partings.... 6	Lower Mahoning	25	0	147	0
Shale, dark-gray		8	0	155	0
Shale, sand, with vein tracings.....		18	0	173	0
Shale, gray, sandy		12	0	185	0
Shale, dark, sandy		1	10	186	10

				Thickness. Ft.	In.	Total. Ft.	In.
Bone coal	0′	2″	Upper Freeport. (1240′ B.)	8	2	195	0
Coal	0	2					
Bone	0	6½					
Coal	1	1					
Binder	0	8½					
Coal	0	2					
Binder	0	3					
Coal and binder mixed	0	3					
Coal	0	4					
Fire clay binder	0	4					
Coal (core lost)	0	6					
Shale	1	10					
Coal	1	0					
Shale	0	1					
Coal	0	3					
Shale	0	1					
Coal	0	5					
Shale, sandy				6	0	201	0
Fire clay shale				2	0	203	0
Shale, sandy				10	0	213	0
Fire clay shale				2	5	215	5
Shale, sandy, with fire clay				18	0	233	5
Sandstone, Upper Freeport				23	1	256	6
Fire clay shale				0	6	257	0
Sandstone, coarse, Lower Freeport				30	0	287	0
Shale, dark, mixed with coal streaks, Upper Kittanning Coal horizon				2	6	289	6
Shale, dark-gray, to bottom				4	0	293	6

The **James Poling No. 1 (31) Boring**, located on a branch of Brushy Fork of Teter Creek, 0.3 mile north of Valley Furnace, starts at a level of about 25 feet above the Brush Creek Coal. Its detailed record was not obtained.

The following is the record of a churn drill hole in the same vicinity:

Charles Nestor Coal Test Boring (32).

Cove District; on Brushy Fork of Teter Creek, 0.4 mile southwest of Valley Furnace; authority, J. M. Guffey; elevation, 1460′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Drift, shale, and sandstone	205	0	205	0
Coal, streak, Middle Kittanning	...	..	205	0
Unrecorded, with sandstone	22	9	227	9
Coal, Lower Kittanning	5	0	232	9
Fire clay	1	11	234	8

The record of the **Lewis Auvill No. 1 (33) Boring,** located on Brushy Fork of Teter Creek, 1 mile northeast of Nestorville, is published in connection with the section for Nestorville, page 104.

The **S. B. Stalnaker No. 1 (34) Boring,** located on a branch of Flat Run, 0.5 mile southwest of Nestorville, starts about 190 feet above the Lower Kittanning Coal. Its detailed record was not secured.

DETAILED COAL TEST RECORDS, GLADE DISTRICT, BARBOUR

In Glade District five holes have been bored for coal, the logs of three of which are available through the courtesy of John M. Rayburn, Mining Engineer, of Pittsburgh, Pennsylvania, who had them bored for Col. J. M. Guffey. The following is the record of one of these holes:

E. P. Moore No. 1 Coal Test Boring (35).

Glade District; on Glady Creek, 0.8 mile northwest of Meadowville; authority, J. M. Guffey; elevation, 1580' B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface clay and sand	20	0	20	0
Shale, sandy	49	0	69	0
Coal, Upper Freeport	4	8	73	8
Shale	80	3	153	11
Coal, Lower Freeport	3	1	157	0
Shale	62	0	219	0
Coal, Upper Kittanning	1	8	220	8
Shale	28	4	249	0
Coal, Middle Kittanning	1	7	250	7
Shale	34	3	284	10
Coal, Lower Kittanning (small shale partings)	5	7	290	5
Shale	4	7	295	0

The **Regina A. Stalnaker No. 1 (36) Boring** was located on the opposite side of the public highway, but its record was not secured. The **Nelson H. Harris No. 1 (37) Boring,** located on Glady Creek, 0.4 mile south of Meadowville, penetrated all the coals of the Allegheny Series. Its record is published in connection with the section for Meadowville, page 107. The **James O. Boyles No. 1 (38) Boring** was located on Sugar Creek, 1.4 miles southeast of Vannoys Mill. Its detailed record was not secured. The record of the **Isaac Coonts Heirs No. 1 (39) Boring**, located on Sugar Creek, 0.6 mile south of Flora, is published in connection with the section for Flora, page 108.

DETAILED COAL TEST RECORDS, BARKER DISTRICT, BARBOUR.

Twenty holes have been drilled for coal in Barker District, with the evident intention of testing the Lower Kittanning Coal, and the records of these borings would furnish valuable information on the underground coals of the District, but most of the operators refused to give copies of these logs. In such cases there is always serious doubt as to whether the coal sought was found in good development. These borings are all listed in the table of summarized records, pages 397-398, and their locations are shown on Map II.

The **T. T. Elliott No. 1 (47) Boring**, located on Mill Creek, at the northeast edge of Belington, was drilled under a cooperative agreement by the land-owners of that vicinity. According to Mr. J. F. Robinson, of Belington, agent for those interested, the hole was drilled 200 feet deep, and found a coal seam not less than 6 feet thick at a depth of 69½ feet, coming just under a white sandstone 18 feet thick. The coal found was evidently the Upper Freeport as the boring starts not far from the Brush Creek horizon. No other coal was found, the hole not being deep enough to reach the Lower Kittanning which should belong at about 250 feet.

Nine holes have been drilled on coal property now in possession of the Davis Coal and Coke Company in the southern end of the District, and the detailed records of five of these have been secured from that company, as follows:

Davis Coal & Coke Co. No. 5 Coal Test Boring (52).

Barker District; on the Tygart Valley River, 0.7 mile south of Dartmoor; authority, Davis Coal & Coke Co.; completed, March 22, 1911; elevation, 1835′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Clay, yellow	8	0	8	0
Shale, soft, light	13	0	21	0
Shale, gray, sandy	11	0	32	0
Sandstone, **Upper Freeport**	13	0	45	0
Shale, gray	10	0	55	0

				Thickness.		Total.	
				Ft.	In.	Ft.	In.
Sandstone				8	0	63	0
Shale, gray				3	0	66	0
Fire clay, flint				2	0	68	0
Shale, gray, sandy				10	0	78	0
Shale, gray, sticky				12	0	90	0
Shale, gray, sandy				33	0	123	0
Shale, dark				5	0	128	0
Sandstone				4	0	132	0
Shale, gray				9	0	141	0
Shale, gray, sandy				24	0	165	0
Shale, dark				12	4	177	4
Coal	0′	5″	**Middle Kittanning**	9	5	186	9
Shale, dark	1	8					
Coal	2	0					
Shale, soft, sticky	2	0					
Coal	1	6					
Sandstone	1	1					
Coal	0	9					
Shale, dark				2	5	189	2
Coal	3′	5″	**Lower Kittanning**	6	7	195	9
Binder	0	2					
Coal	3	0					
Fire clay				1	3	197	0

Davis Coal & Coke Co. No. 1 Coal Test Boring (53).

Barker District; on Beaver Creek, 0.9 mile southeast of Dartmoor; authority, Davis Coal & Coke Co.; completed, February 24, 1911; elevation, 2050′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Clay	3	0	3	0
Clay and boulders	3	0	6	0
Clay	4	0	10	0
Clay shale	2	0	12	0
Shale, dark	11	0	23	0
Shale, light-gray	9	0	32	0
Shale, tough, blue	21	0	53	0
Shale, blue	27	0	80	0
Shale, sandy	6	0	86	0
Sandstone, Lower Freeport	12	0	98	0
Shale, gray	10	0	108	0
Sandstone	6	0	114	0
Shale, gray	3	0	117	0
Sandstone, shaly	5	0	122	0
Shale, blue	2	0	124	0
Sandstone, shaly	6	0	130	0
Shale, tough, blue	26	0	156	0
Shale, gray	14	0	170	0
Sandstone, shaly	3	0	173	0
Shale, gray	12	0	185	0
Shale, gray, sandy	8	0	193	0
Shale, blue	10	0	203	0
Shale, dark	3	10	206	10

			Thickness.		Total.	
			Ft.	In.	Ft.	In.
Coal	1′ 0″	Middle Kittanning	2	6	209	4
Shale, dark	0 5					
Coal	1 1					
Shale, gray			2	0	212	1
Coal	2′ 7″	Lower Kittanning	5	0	217	1
Bone coal	0 4					
Coal	2 1					
Fire clay			0	5	217	6
Shale, sandy			4	6	222	0

Davis Coal & Coke Co. (Wm. Phillips) No. 2 Coal Test Boring (54).

Barker District; on the ridge 0.9 mile southeast of Dartmoor; authority, Davis Coal & Coke Co.; completed, March 2, 1911; elevation, 2085′ B.

			Thickness.		Total.	
			Ft.	In.	Ft.	In.
Clay, yellow			9	0	9	0
Clay shale			1	0	10	0
Shale, dark			20	0	30	0
Shale, soft, gray			14	0	44	0
Shale, blue, sandy			1	0	45	0
Shale, gray, sandy			8	0	53	0
Shale, gray			4	0	57	0
Shale, variegated			20	0	77	0
Sandstone, Lower Freeport			20	0	97	0
Shale, gray			9	0	106	0
Shale, gray, sandy			32	0	138	0
Shale, gray			3	0	141	0
Fire clay, flint			2	0	143	0
Shale, gray			18	0	161	0
Shale, gray, with sandstone partings			27	0	188	0
Shale, gray			9	2	197	2
Coal	1′ 0″	Middle Kittanning	3	11	201	1
Shale, dark	0 7					
Coal	1 4					
Sand shale	0 5					
Coal	0 7					
Sand shale			5	3	206	4
Coal	2′ 8½″	Lower Kittanning	4	8	211	8
Shale, dark	0 4					
Coal	1 7					
Fire clay			1	0	212	8

Davis Coal & Coke Co. (Wm. J. Phillips) No. 3 Coal Test Boring (56).

Barker District; on Beaver Creek, 1.3 miles east of Dartmoor; authority, Davis Coal & Coke Co.; completed, March 11, 1911; elevation, 2050' B.

		Thickness.		Total.	
		Ft.	In.	Ft.	In.
Clay, yellow		6	0	6	0
Gravel and clay		3	0	9	0
Shale, soft, light		5	0	14	0
Sandstone, medium-hard, Lower Freeport		6	0	20	0
Shale, blue		4	0	24	0
Sandstone		10	0	34	0
Shale, gray		12	0	46	0
Limestone, Johnstown		2	0	48	0
Shale, variegated		11	0	59	0
Shale, gray, sticky		6	0	65	0
Shale, gray, and shale, sandy, mixed		24	0	89	0
Shale, dark		4	1	93	1
Coal ....0' 10"	Middle Kittanning	5	5	98	6
Shale, dark......2 6					
Coal 1 4					
Sandstone 0 5					
Coal 0 4					
Shale, dark		2	4	100	10
Coal ....2' 2"	Lower Kittanning	3	0	103	10
Shale, dark.......0 3					
Coal 0 7					
Fire clay		3	2	107	0

Davis Coal & Coke Co. (E. B. Ryan) No. 4 Coal Test Boring (57).

Barker District; on the head of Mill Creek, 1.8 miles east of Dartmoor; authority, Davis Coal & Coke Co.; completed, March 15, 1911; elevation, 2175' B.

		Thickness.		Total.	
		Ft.	In.	Ft.	In.
Clay, yellow		3	0	3	0
Shale, gray		5	0	8	0
Shale, soft clay		10	0	18	0
Shale, dark		11	10	29	10
Coal, Upper Freeport		0	8	30	6
Shale, soft, gray		19	6	50	0
Shale, gray, sandy		8	0	58	0
Sandstone, broken.. 5'	Upper Freeport	15	0	73	0
Sandstone, medium-hard 10					
Shale, gray, with hard sandstone bands		7	0	80	0
Sandstone, hard, Lower Freeport		14	0	94	0

	Thickness. Ft.	In.	Total. Ft.	In.
Shale, black	1	0	95	0
Sandstone, medium-hard	3	0	98	0
Sandstone, hard	14	0	112	0
Shale, gray	8	0	120	0
Limestone, Johnstown	1	0	121	0
Shale, gray	4	0	125	0
Shale, gray, sandy	26	0	151	0
Shale, gray, sandy, with sandstone bands	12	0	163	0
Shale, gray	4	0	167	0
Sandstone, medium-hard, East Lynn	15	0	182	0
Shale, gray	8	0	190	0
Shale, dark	5	3	195	3
Coal, bony	0	5	195	8
Shale, soft, sticky	4	4	200	0
Shale, dark	4	10	204	10
Coal ....1′ 6″ Sandstone ....0 7 Coal, bony ....0 5 } Middle Kittanning	2	6	207	4
Shale, gray	1	10	209	2
Coal ....2′ 3″ Shale, gray ....0 4 Coal ....0 7 } Lower Kittanning	3	2	212	4
Fire clay	2	8	215	0

DETAILED COAL TEST RECORDS, VALLEY DISTRICT, BARBOUR.

In Valley District 23 holes have been bored for coal by the Valley Coal and Coke Company, of Ridgeway, Pennsylvania. Through the courtesy of J. C. Williams, geologist of the company, six of these records are available, as given on the following pages:

A. W. Helwig No. 6 Coal Test Boring (63).

Valley District; on the ridge 1 mile southwest of Wilmoth Ford; authority, Valley Coal & Coke Co.; elevation, 1925′ L.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface	25	0	25	0
Sandstone, soft, gray ....3′ 0″ Sandstone, hard, gray ....12 0 Sandstone, dark-gray ....12 10 } East Lynn	27	10	52	10
Coal, bony, Middle Kittanning	1	0	53	10
Clay	5	2	59	0
Gray slate and shale	6	0	65	0
Coal, Lower Kittanning	6	0	71	0
Fire clay, to bottom	3	0	74	0

A. V. Wilmoth No. 5 Coal Test Boring (64A).

Valley District; on a branch of Middle Fork River; 0.3 mile southeast of Werner; authority, Valley Coal & Coke Co.; elevation, 2160' L.

		Thickness. Ft.	In.	Total. Ft.	In.
Surface		1	0	1	0
Sand, gray, coarse		5	0	6	0
Slate, gray		20	0	26	0
Lime		3	0	29	0
Clay		1	0	30	0
Slate, gray		11	0	41	0
Sandstone, gray, Mahoning		13	0	54	0
Slate, dark		2	0	56	0
Coal, slaty 1' 9" Coal 1 3	Upper Freeport	3	0	59	0
Clay		3	0	62	0
Slate, dark-gray		10	0	72	0
Sandstone, dark-gray 4' Slate, dark-gray 2 Sandstone, gray 10	Upper Freeport	16	0	88	0
Sand shale, gray		9	0	97	0
Sand, dark, hard		1	0	98	0
Slate, dark		8	0	106	0
Coal, Lower Freeport		0	3	106	3
Slate, dark		2	0	108	3
Sandstone, dark		2	9	111	0
Slate, black		3	6	114	6
Coal 1' 4" Clay, slate parting 1 9 Coal, dirty 0 3 Coal, good 2 1	Upper Kittanning	5	5	119	11
Clay		4	1	124	0
Clay, siliceous		4	0	128	0
Sand shale, gray		8	0	136	0
Sandstone, light-gray, East Lynn		42	0	178	0
Sand, gray		20	0	198	0
Sand, dark		2	0	200	0
Slate, black		8	6	208	6
Coal, Middle Kittanning		0	6	209	0
Sandstone, dark		3	0	212	0
Sandstone, light		7	9	219	9
Coal, bone 0' 2" Coal, good 5 4	Lower Kittanning	5	6	225	3
Fire clay, to bottom		1	3	226	6

Robert Tallman No. 2 Coal Test Boring (68).

Valley District; on the head of Big Run, 2.3 miles southwest of Belington; authority, Valley Coal & Coke Co.; elevation, 1906' L.

	Thickness. Ft.	In.	Total. Ft.	In.
Conductor	9	0	9	0

		Thickness. Ft.	In.	Total. Ft.	In.
Gray sandstone ....19' Light-gray sandstone ....18 Very light sandstone 31	Lower Freeport	68	0	77	0
Slate shale........................		33	0	110	0
Sandstone		9	0	119	0
Black slate........................		4	0	123	0
Gray slate........................		31	0	154	0
Coal, Middle Kittanning...........		4	6	158	6
Slate and rock....................		4	0	162	6
Coal, Lower Kittanning...........		7	0	169	6

"I was called away and the driller, Mr. C. Ball, gave me the above log."

The record of the **Cora Wilson (Wm. Boner) No. 1 (69) Boring,** located 1 mile southwest of Dartmoor, is published in the section for Junior, page 115. The record of the **Blackman Wilmoth No. 3 (70) Boring,** located on the head of Grassy Fork of Zebs Creek, 2.5 miles southwest of Belington, is published in connection with the section for Belington, page 112.

John Gibson No. 4 Coal Test Boring (73).

Valley District; on a branch of Grassy Fork of Zebs Creek, 3.7 miles southwest of Zebs Creek; authority, Valley Coal & Coke Co.; elevation, 1919' L.

		Thickness. Ft.	In.	Total. Ft.	In.
Surface		7	0	7	0
Sandstone, gray..................		32	6	39	6
Fire clay.......................		3	0	42	6
Gray sandstone and slate......30' 0" Sandstone, coarse, hard 42 6	East Lynn	72	6	115	0
Sand, very hard.................		0	6	115	6
Slate		2	6	118	0
Coal, Middle Kittanning...........		3	10	121	10
Fire clay........................		0	6	122	4
Sandstone, gray..................		20	10	143	2
Coal, cannel......0' 9" **Coal** 6 6	**Lower Kittanning**	7	3	150	5
Clay		1	4	151	9
Sandstone, coarse, white, to bottom		2	3	154	0

RECORDS OF COAL TEST BORINGS, UPSHUR COUNTY.

SUMMARIZED RECORDS.

In Upshur 33 tests have been bored for coal, many of which were made with the diamond drill and the remainder with the churn drill that preserves no core. The accurate locations and surface elevations of all these holes were secured in the field and an attempt to obtain the detailed records was made, but through inability or unwillingness many of the operators failed to honor the requests for this information. The following table, similar to that published for Barbour County, pages 397-398, the explanations concerning which are applicable here, gives the surface elevations, ownership, and the condensed records of such borings as were obtained. The following abbreviations of company names have been used:

Buckhannon River	Buckhannon River Coal Company.
Hart Bros	Hart Brothers.
Red Rock	Red Rock Fuel Company.
Steele et al	George M. Steele and others.

Summarized Record of Tests for Coal in Upshur County.

No. on Map IV.	Name of Property.	Magisterial District.	Company.	Elevation Above Tide.	Redstone Coal.		Pittsburgh Coal.		Upper Freeport Coal.		Upper Kittanning Coal		Lower Kittanning Coal		Total Depth.	No. on Map IV.
					Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.		
75	I. C. Ours Heirs No. 1	Warren	Red Rock	1445B	....	....	....	....	....	....	....	....	....	....	....	75
76	Joseph Reeder No. 1	Warren	Red Rock	1475B	....	....	....	....	....	....	....	....	....	....	....	76
77	Marion Mick No. 1	Warren	Red Rock	1485B	....	....	....	....	....	....	....	....	....	....	....	77
78	Martin & Young No. 1	Warren	Red Rock	1545B	....	....	....	....	....	....	....	....	....	....	....	78
79	Chas. D. Munson No. 1	Buckhannon	Red Rock	1515B	....	....	....	....	....	....	....	....	....	....	....	79
80	Ony Mick No. 1	Buckhannon	Red Rock	1520B	....	....	....	....	....	....	....	....	....	....	....	80
81	Philip Smith No. 1	Buckhannon	A. D. Simon	1465B	....	....	....	....	....	....	....	....	....	....	....	81
82	Hyre Brake No. 1	Buckhannon	Red Rock	1455B	11.3	4.3	50.4	0.2	....	....	....	....	....	....	67	82
83	D. D. T. Farnsworth Heirs No. 1	Buckhannon	Jabez Wooley	1420B	....	....	....	....	227.6	1.2	372.1	3.5	....	....	449.6	83
84	S. J. Strader No. 1	Buckhannon	A. D. Simon	1455B	....	....	....	....	....	....	....	....	....	....	200.2	84
85	Lloyd Brake No. 1	Buckhannon	Buckhannon River	1440B	....	....	....	....	53.5	5.5	....	....	....	....	71	85
86	T. B. Lane No. 1	Buckhannon	A. D. Simon	1425B	....	....	....	....	48	5.9	....	....	....	....	48.9	86
86A	Albert Hinkle No. 1	Buckhannon	A. D. Simon	1470B	....	....	....	....	175	6.5	....	....	....	....	185	86A
87	Ithiel Hinkle No. 1	Buckhannon	Buckhannon River	1530B	....	....	....	....	184	5.5	....	....	....	....	190	87
87A	Henry Crites (Dexter Gould) No. 1	Buckhannon	A. D. Simon	1445B	....	....	....	....	....	....	....	....	....	....	....	87A
88	J. W. Strader No. 2	Buckhannon	A. D. Simon	1460B	....	....	....	....	....	....	....	....	....	....	....	88
89	J. W. Strader No. 1	Buckhannon	A. D. Simon	1505B	....	....	....	....	....	....	....	....	....	....	....	89
90	A. O. Cutright No. 1	Buckhannon	A. D. Simon	1610B	....	....	....	....	....	....	....	....	....	....	....	90
91	John E. Geibel No. 1	Union	Bentley & Gerwig	2110B	....	....	....	....	....	....	....	....	....	....	401	91
92	S. G. Casto No. 1	Meade	Buckhannon River	1431L	....	....	....	....	....	....	56.5	0.5	117	1.5	281	92
93	Ashley Morgan No. 1	Meade	Coal & Coke Ry	1530B	....	....	....	....	....	....	....	....	....	....	....	93
94	Arthur Gould No. 1	Meade	Coal & Coke Ry	1455B	....	....	....	....	....	....	....	....	....	....	....	94
95	John Hefner No. 1	Meade	Coal & Coke Ry	1470B	....	....	....	....	....	....	....	....	....	....	....	95
96	Chas. A. Abbott No. 1	Meade	Coal & Coke Ry	1490B	....	....	....	....	....	....	....	....	....	....	....	96
97	Ira A. Lawson No. 1	Meade	Coal & Coke Ry	1502L	....	....	....	....	....	....	....	....	....	....	....	97
98	Will Lance No. 1	Meade	A. D. Simon	1395B	....	....	....	....	....	....	....	....	....	....	206	98
99	Edwin I. Hyre No. 1	Meade	Coal & Coke Ry	1460L	....	....	....	....	....	....	....	....	....	....	....	99
99A	Samuel Swecker No. 1	Meade	A. D. Simon	1460B	....	....	....	....	....	....	....	....	....	....	....	99A
100	G. W. Fish No. 1	Meade	G. W. Fish	1845B	....	....	....	....	....	....	....	....	....	....	....	100
101	Geo. M. Steele No. 1	Washington	Steele et al	1855B	....	....	....	....	....	....	....	....	....	....	....	101
102	Hart Bros. No. 2	Washington	Hart Bros	1850B	....	....	....	....	....	....	....	....	....	....	....	102
103	Hart Bros. No. 1	Washington	Hart Bros	1855B	....	....	....	....	....	....	....	....	....	....	....	103
104	Gordon B. Brake No. 1	Banks	Coal & Coke Ry	1515B	....	....	....	....	....	....	....	....	....	....	....	104

DETAILED COAL TEST RECORDS, WARREN DISTRICT, UPSHUR.

Four holes have been bored for coal in Warren District, mainly to test the Redstone and Pittsburgh seams, all of them being located on the waters of Turkey Run, as shown on Map IV. None of these records was secured.

DETAILED COAL TEST RECORDS, BUCKHANNON DISTRICT, UPSHUR.

In Buckhannon District 14 holes have been drilled, partly to test the Redstone and Pittsburgh, and partly to locate the Upper Freeport Coal. Some of these records are available, as follows:

Hyre Brake No. 1 Coal Test Boring (82).

Buckhannon District; on Mud Lick Run, 2.5 miles northeast of Lorentz; authority, Red Rock Fuel Company; completed, September 12, 1911; elevation, 1455′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface	8	0	8	0
Slate, gray	3	4	11	4
Coal, Redstone	4	4	15	8
Fire clay	2	0	17	8
Sandstone, Weston	8	6	26	2
Slate, gray	7	0	33	2
Limestone, Redstone	10	0	43	2
Fire clay and limestone, in streaks	7	3	50	5
Coal and slate (should be Pittsburgh seam)	0	3	50	8
Slate and fire clay	6	4	57	0
Sandstone	2	6	59	6
Shale, gray, and fire clay	7	6	67	0

The record of the **D. D. T. Farnsworth No. 1 (83) Boring,** located at Buckhannon, is published in connection with the section for that place, page 126. The record of the **S. J. Strader No. 1 (84) Boring,** located on the head of Cutright Run, 2 miles southwest of Tenerton, is published in connection with the section for Cutright Run, page 128. It was not drilled deep enough to reach the Upper Freeport Coal, which it was intended to test.

Lloyd Brake No. 1 Coal Test Boring (85).

Buckhannon District; on Cutright Run, 1.1 miles northeast of Hinkleville; authority, Buckhannon River Coal Co.; elevation, 1440′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Clay, gravel, and yellow shale	12	0	12	0
Shale, blue	21	0	33	0
Shale, dark	2	0	35	0
Shale, blue, sandy	18	0	53	0
Slate, black	0	6	53	6
Coal, Upper Freeport	5	6	59	0
Shale, blue	12	0	71	0

T. B. Lane No. 1 Coal Test Boring (86).

Buckhannon District; on Cutright Run, 0.9 mile northward from Hinkleville; authority, A. D. Simon; elevation, 1425′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface	16	0	16	0
Sandstone, **Mahoning**	14	0	30	0
Slate	13	0	43	0
Coal ....5′ 4″ Slate ......0 2 **Coal** ....0 5 **Upper Freeport**	6	11	49	11

Albert Hinkle No. 1 Coal Test Boring (86A).

Buckhannon District; on Cutright Run, 0.9 mile northwest of Hinkleville; authority, A. D. Simon; elevation, 1470′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface	5	0	5	0
Sandstone, yellow..10′ Sandstone, green...20 Shale, gray......... 7 Sandstone, white... 4 **Saltsburg**	41	0	46	0
Shale, dark-gray	6	0	52	0
Sand shale, gray	12	0	64	0
Slate, black	4	0	68	0
Coal, Bakerstown	1	6	69	6
Shale, gray, pavement	4	6	74	0
Sand shale, gray	9	0	83	0
Shale, gray	11	0	94	0
Shale, red	5	0	99	0
Blue rock	18	0	117	0
Shale, dark-gray	11	0	128	0
Shale, red	16	0	144	0
Sand shale, gray	5	0	149	0
Sand rock, steel-gray, **Mahoning**	16	0	165	0
Shale, gray	5	0	170	0
Slate, black	5	0	175	0
Coal, Upper Freeport	6	6	181	6
Shale, gray, pavement	3	6	185	0

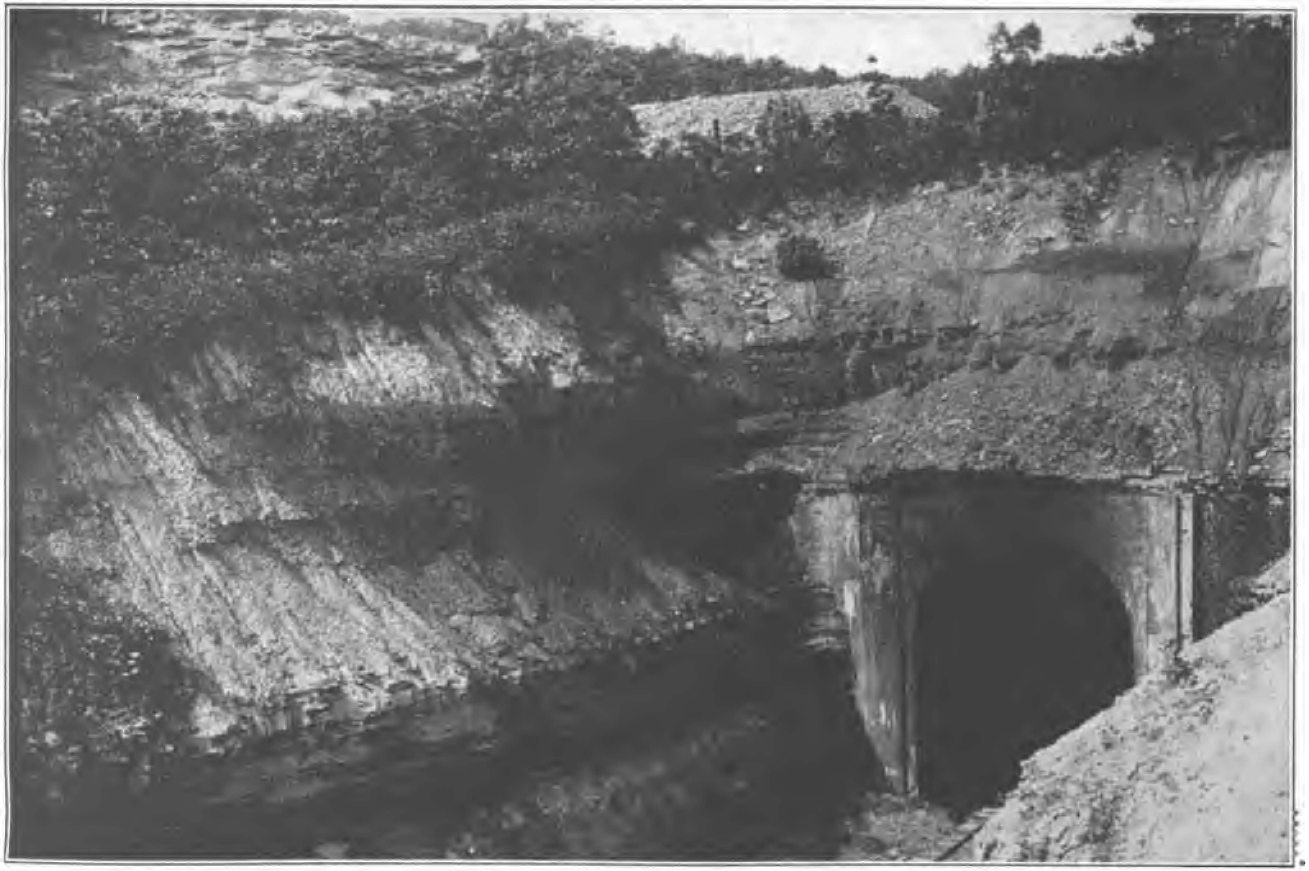

PLATE XXIII.—View at west portal of Sand Run Tunnel on Coal & Coke Railway, showing East Lynn Sandstone quarry (at top), Middle Kittanning Coal (just above tunnel roof), and Lower Kittanning Coal (center of tunnel).

Ithiel Hinkle No. 1 Coal Test Boring (87).

Buckhannon District; on Cutright Run, 1.1 miles northwest of Hinkleville; authority, Buckhannon River Coal Co.; elevation, 1530′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface	8	0	8	0
Sand shale	42	0	50	0
Slate	27	0	77	0
Sandstone	12	0	89	0
Fire clay	7	0	96	0
Sand shale	28	0	124	0
Sandstone	39	0	163	0
Slate	21	0	184	0
Coal, Upper Freeport	5	6	189	6
Fire clay	0	6	190	0

DETAILED COAL TEST RECORDS, UNION DISTRICT, UPSHUR.

The only test bored for coal in Union District is the **John E. Geibel No. 1 (91)**, located on the ridge 0.7 mile southwest of Midvale, where the Coal and Coke Railway crosses Middle Fork River. According to Teets, this boring starts about 10 feet below the Lower Kittanning Coal horizon, one coal, 1′ 6″ thick, being found at 17 feet, which would correlate with the Clarion, and another, 0′ 7″ thick, at 317 feet that may represent the Gilbert Coal.

DETAILED COAL TEST RECORDS, MEADE DISTRICT, UPSHUR.

In Meade District 10 holes have been bored for coal, several of them being in the region west of Adrian where the Upper Freeport Coal lies under drainage. Unfortunately, only a few of these records have been obtained. The following hole starts about 70 feet below the Upper Freeport Coal:

S. G. Casto No. 1 Coal Test Boring (92).

Meade District; on Bull Run, at Adrian; authority, Buckhannon River Coal Company; elevation, 1431′ L.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface	8	0	8	0
Sand shale, gray	22	0	30	0
Shale, dark	19	0	49	0
Shale, gray, soft	5	0	54	0
Slate, black	2	6	56	6

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Coal and bone, Upper Kittanning	0	6	57	0
Shale, dark-gray	3	0	60	0
Conglomerate, dark-brown ....4' 0" Sandstone, white....2 0 Conglomerate, dark..1 6	7	6	67	6
Coal, Middle Kittanning	0	6	68	0
Shale, gray	2	0	70	0
Shale, dark	10	0	80	0
Shale, gray	6	0	86	0
Shale, dark	8	0	94	0
Sandstone, dark-brown..4' Conglomerate, dark.....4	8	0	102	0
Shale, gray, soft	7	0	109	0
Fire clay	3	0	112	0
Shale, gray	5	0	117	0
Coal, Lower Kittanning	1	6	118	6
Shale, gray, pavement	5	6	124	0
Steel-gray rock...14' Sandstone, white.46 Sandstone, dark.. 1 } **Homewood**	61	0	185	0
Slate, dark	1	6	186	6
Coal, Upper Mercer	0	6	187	0
Sandstone, white	16	0	203	0
Sand shale, dark	10	0	213	0
Slate, black	9	0	222	0
Coal, Lower Mercer	1	0	223	0
Shale, dark-gray	16	0	239	0
Slate, black	16	0	255	0
Shale, gray	14	0	269	0
Coal, Quakertown	7	0	276	0
Shale, pavement	4	0	280	0
Sandstone, dark	1	0	281	0

Will Lance No. 1 Coal Test Boring (98).

Meade District; on Pringle Fork of Stonecoal Creek, 0.6 mile northwest of Abbott; authority, A. D. Simon; completed, December 31. 1906; elvation, 1395' B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface	35	0	35	0
Soapstone and shale	32	0	67	0
Sandstone	16	0	83	0
Coal, bony, Bakerstown	1	6	84	6
Fire clay	16	0	100	6
Shale, red	4	0	104	6
Shale, light	6	0	110	6
Shale, red	4	0	114	6
Fire clay, red	4	6	119	0
Shale, light	3	6	122	6
Sandstone	23	6	146	0
Slate, black	6	0	152	0

	Thickness. Ft.	Thickness. In.	Total. Ft.	Total. In.
Soapstone	20	0	172	0
Shale, light	11	0	183	0
Coal, bony, Brush Creek	0	8	183	8
Fire clay and soapstone, to bottom	22	4	206	0

The **G. W. Fish No. 1 (100) Boring,** located on Big Run of Buckhannon River, just southwest of Alton, was drilled to about 350 feet, according to Mr. Fish, of Buckhannon, but as a portion of the core had been lost and no other record was kept it was impossible to compile a log of the hole.

DETAILED COAL TEST RECORDS, WASHINGTON DISTRICT, UPSHUR.

Only three holes have been bored for coal in Washington District. The **Geo. M. Steele No. 1 (101),** located at the forks of Middle Fork River, 0.7 mile southwest of Gale, starts about 320 feet below the Lower Kittanning Coal and probably tested the lower coals of the Pottsville Series, but its record could not be secured.

At Alexander, on the Buckhannon River, the locations of two bore holes were pointed out to the writer, and they have been placed on Map IV, but according to Mr. J. B. Hart, of Clarksburg, West Virginia, one of the owners of the property when the holes were reported drilled, only one test was started and this was abandoned before much drilling was done.

DETAILED COAL TEST RECORDS, BANKS DISTRICT, UPSHUR.

In Banks District the only test bored for coal was the **Gordon B. Brake No. 1 (104),** located on Whites Camp, 1.7 miles southwest of Rock Cave. This hole starts 54 feet, by hand-level, below the Brush Creek Coal, but its detailed record is not available.

RECORDS OF COAL TEST BORINGS, WESTERN PORTION OF RANDOLPH COUNTY.

SUMMARIZED RECORDS.

In western Randolph 38 holes have been bored for coal, some of which were made with the diamond drill and the remainder with the common churn drill. The accurate locations and surface elevations of all these borings were secured and the detailed records of nearly all of them were obtained from the operators, furnishing most valuable information on the coal resources of the county.

The following table, similar to that published for Barbour County, pages 397-398, the explanations concerning which are applicable here, gives the surface elevations, ownership, and the condensed records of nearly all the holes. The following abbreviations of company names have been used:

A. Wood I. & S.	Alan Wood Iron & Steel Company.
Alex. B. & L.	Alexander Boom and Lumber Company.
Berwind-White	Berwind-White Coal Company.
Davis C. & C.	Davis Coal and Coke Company.
Elkhorn	Elkhorn Coal Corporation.
Western Md. Ry.	Western Maryland Railway.

DETAILED COAL TEST RECORDS, LEADSVILLE DISTRICT, RANDOLPH.

Eight holes have been drilled in Leadsville District, all of which start below the Lower Kittanning Coal and are therefore tests of the Pottsville Measures. The record of the **Coberly No. 1 (105) Boring**, located along the Tygart Valley River, 0.9 mile southwest of Gage, and previously published in Volume II, page 360, of the Survey, is published in the present Report along with the section for Gage, page 161. The record of the **Wm. Corley No. 9 (108) Boring**, furnished the Survey by John T. Davis, of Elkins, and located along the Tygart Valley River at Roaring Creek Junction Station, is published in connection with the section for that place, page 166. The well still makes a large artesian flow of sulphur water. The following is the record of a churn drill hole, located near where the Tygart Valley River cuts through the Laurel Ridge, having been furnished the Survey by P. B. Bloomfield, of Elkins, General Manager of the company that made it:

Summarized Record of Tests for Coal in Western Randolph County.

No. on Map IV.	Name of Property.	Magisterial District.	Company.	Elevation Above Tide.	Campbell Creek Coal.		Eagle Coal.		Hughes Ferry Coal.		Castle Coal.		Sewell Coal.		Total Depth.	No. on Map IV.
					Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.	Depth. Top.	Thickness. Feet.		
105	Coberly No. 1	Leadsville	Western Maryland R	1750B			203.7	2							211.5	105
106	Davis Colliery Co. No. 1	Leadsville	Davis Colliery	1945B												106
107	Davis Colliery Co. No. 2	Leadsville	Davis Colliery	1939L												107
108	Wm. Corley No. 9	Leadsville	Davis Colliery	1858L	273.2	0.6	351.8	0.3	415.2	5.3	431.3	2.7	483.1	2.7	477.6	108
109	Elkins Electric Ry. Co. No. 1	Leadsville	Elkins Electric Ry.	2060B									39	3	150	109
109A	Davis Coal & Coke Co.	Leadsville	Davis C. & C.	1920B												109A
110	Susan Darby No. 2	Leadsville	Davis C. & C.	2430B											373.4	110
111	Susan Darby No. 1	Leadsville	Davis C. & C.	2365B	157.6	3.6	266.2	6					445.4	2	447.4	111
112	J. J. Phillips No. 1	Roaring Creek	Davis Colliery	2470B												112
112A	James Curtis No. 1	Roaring Creek	Davis C. & C.	2250B			197.2	6.9	249.1	2.8					327	112A
112B	Maxwell & Crawford No. 2	Roaring Creek	Davis C. & C.	2500B					52.2	4.6			196	1.5	298	112B
112C	Maxwell & Crawford No. 3	Roaring Creek	Davis C. & C.	2540B	151.5	0.7	246.9	3.4							255	112C
113	P. J. Cain No. 1	Roaring Creek	P. J. Cain	1849L			70	0.2	197.9	0.3			340.4	0.9	563.4	113
114	Andrew Currence No. 11	Middle Fork	Davis Colliery	2092B									9	3.2	295.8	114
114A	Cassity Fork B. & L. Co. No. 1	Middle Fork	A. Wood I. & S.	2520B	351.3	2.3	446.9	1.4					664.3	0.3	783	114A
114B	Cassity Fork B. & L. Co. No. 2	Middle Fork	A. Wood I. & S.	2145B	14.5	3.3	144.5	1.0			268.3	0.4	338.0	1.0	371	114B
114C	Cassity Fork B. & L. Co. No. 3	Middle Fork	A. Wood I. & S.	2765B			209.3	1.7	295	1.0			479.6	1.7	591	114C
115	Womelsdorff Heirs No. 12	Middle Fork	Davis Colliery	2170B					65.9	0.2	150.6	2.3	101.2	4.1	392.7	115
116	John Fincham No. 14	Middle Fork	Davis Colliery	2214L									108.3	1.7	379.7	116
117	K. E. Zickefoose No. 13	Middle Fork	Davis Colliery	2323L					14.7	1.6	103.8	2	220.2	2.6	320.9	117
118	Alex. Boom & Lumber Co. No. 1	Middle Fork	Alex. B. & L.	2955B												118
119	Elkhorn Coal Corp. No. 2	Middle Fork	Elkhorn	2865B					53.2	4.5			196.5	7.9	350	119
120	Elkhorn Coal Corp. No. 1	Middle Fork	Elkhorn	2340B									75.2	6.6	385.5	120
121	Elkhorn Coal Corp. No. 9	Middle Fork	Elkhorn	3055B							262.5	0.8	363.6	2.5	375	121
122	Elkhorn Coal Corp. No. 3	Middle Fork	Elkhorn	3350B					414	0.5			587	1.9	677	122
123	Elkhorn Coal Corp. No. 4	Middle Fork	Elkhorn	2945B					21	1.1			191	3.7	205	123
124	Elkhorn Coal Corp. No. 6	Middle Fork	Elkhorn												186	124
125	Elkhorn Coal Corp. No. 5	Middle Fork	Elkhorn	2945B					23	2	97	0.2	202	2.2	308	125
126	Elkhorn Coal Corp. No. 7	Middle Fork	Elkhorn	2870B									86	2.7	90	126
127	Elkhorn Coal Corp. No. 8	Middle Fork	Elkhorn	2935B									201	3	217	127
128	Elkhorn Coal Corp. No. 1	Middle Fork	Elkhorn	3175B			54	1.2	188.1	2.3	250.1	3	371.2	2.3	450.2	128
129	Elkhorn Coal Corp. No. 2	Middle Fork	Elkhorn	3175B			63.2	0.5	194	1.3			367	3.1	374	129
130	Buckhannon Chemical Co. No. 1	Middle Fork		1905B											320	130
131	J. A. McCauley No. 1	Middle Fork	Cutright Bros	2335B			12	4							16	131
132	Holly Lumber Co. No. 1	Middle Fork	Holly Lumber	2690B			56	4								132
133	Ward & Hutton No. 2	Huttonsville	Berwind-White	3605B												133
134	Ward & Hutton No. 1	Mingo	Berwind-White	3780B												134
135	Ward & Hutton No. 3	Mingo	Berwind-White	3390B												135

Elkins Electric Railway Co. No. 1 Coal Test Record (109).

Leadsville District; on the Tygart Valley River, 1.8 miles east of Roaring Creek Junction; authority, Elkins Electric Railway; elevation, 2060′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Dirt and small stone	30	0	30	0
Sandstone, hard	9	0	39	0
Coal, Welch (1′ 6″), and fire clay	3	0	42	0
Sandstone, shaly	108	0	150	0

The two following holes were bored well up against the slope of the Laurel Ridge where the measures are rising rapidly eastward:

Susan Darby No. 2 Coal Test Boring (110).

Leadsville District; on a branch of Beaver Creek, 1.1 miles southeast of Weaver; authority, Davis Coal & Coke Co.; elevation, 2430′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Soil	16	0	16	0
Slate	2	0	18	0
Slate and little coal, Quakertown	1	0	19	0
Slate	7	0	26	0
Sandstone ...... 4′ Sandstone, blue, very hard, and broken ....11 Sandstone, gray..11 } **Lower Connoquenessing**	26	0	52	0
Coal, Alma (?)	0	5	52	5
Slate	3	0	55	5
Sandstone, gray.. 5′ 6″ Sandstone, blue, very hard and broken ....29 0 } **Monitor (?)**	34	6	89	11
Flint, very coarse and pebbly	8	0	97	11
Flint, coarse-grained	3	0	100	11
Flint	9	0	109	11
Sandstone, very hard and flinty	21	0	130	11
Flint	3	0	133	11
Slate	13	0	146	11
Sandstone, gray	2	0	148	11
Slate and sandstone, mixed	19	0	167	11
Sandstone, gray	32	0	199	11
Slate, black	5	0	204	11
Sandstone, gray	8	6	213	5
Slate and sandstone, mixed	63	0	276	5
Slate, black	2	4	278	9
Slate and sandstone, mixed	17	8	296	5
Sandstone, gray	70	0	366	5
Slate, black, and sandstone, mixed	7	0	373	5

Susan Darby No. 1 Coal Test Boring (111).

Leadsville District; on a branch of Beaver Creek, 1.1 miles east of Weaver; authority, Davis Coal & Coke Co.; elevation, 2365′ B.

	Thickness. Ft.	Thickness. In.	Total. Ft.	Total. In.
Coal? Quakertown	4	0	4	0
Soil	6	0	10	0
Shale	34	0	44	0
Slate	5	0	49	0
Sandstone, gray, Lower Connoquenessing	18	0	67	0
Slate	5	0	72	0
Sandstone, gray	1	0	73	0
Slate and sandstone, mixed	18	0	91	0
Sandstone, gray	4	0	95	0
Slate and sandstone, mixed	8	0	103	0
Sandstone, blue, very hard..... 5′ 0″ Sandstone, blue, broken, very hard ....24 0 Sandstone, gray. 0 9 Lower Cedar Grove (?)	29	9	132	9
Slate	18	0	150	9
Slate, black	0	11	151	8
Slate, very soft	3	0	154	8
Clay	3	0	157	8
Coal, Campbell Creek (?)	3	7	161	3
Slate	7	5	168	8
Coal, Powellton (?)	0	6	169	2
Slate	6	0	175	2
Sandstone, gray	35	6	210	8
Slate, mixed with sandstone	5	0	215	8
Slate	12	0	227	8
Sandstone, blue, very hard	31	0	258	8
Slate	1	6	260	2
Slate, black	6	0	266	2
Coal, Eagle	6	0	272	2
Slate, black	6	0	278	2
Slate, gray	0	6	278	8
Slate and sandstone, mixed	31	0	309	8
Sandstone, blue, very hard	21	0	330	8
Slate	1	9	332	5
Slate and sandstone, mixed	16	0	348	5
Sandstone, blue, very hard	21	0	369	5
Sandstone and slate, mixed	4	0	373	5
Sandstone, gray....48′ Sandstone and slate, mixed ....24 Lower Guyandot	72	0	445	5
Coal, Sewell	2	0	447	5

According to Teets, the above boring starts on the outcrop of the Upper Connoquenessing Sandstone, hence the presence of a four-foot seam of coal at the top seems improbable. The record of this hole, as secured by the Survey, had not been well kept and it is possible that the portion of the sandstone overlying this coal may have been omitted.

DETAILED COAL TEST RECORDS, ROARING CREEK DISTRICT, RANDOLPH.

In Roaring Creek District, five holes have been bored for coal, the record of four of which are available, as follows:

P. J. Cain Coal Test Boring (113).

Roaring Creek District; on Middle Fork River, at Midvale; authority, P. J. Cain; elevation, 1849′ L.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface	25	6	25	6
Sandstone	1	0	26	6
Coal, Campbell Creek?	1	5	27	11
Fire clay	1	0	28	11
Slate	9	7	38	6
Coal and bone, Powellton	0	10	39	4
Shale, light	4	0	43	4
Shale, dark	8	8	52	0
Slate, black	18	0	70	0
Coal and bone, Eagle	0	3	70	3
Shale, dark	5	0	75	3
Sand shale	16	9	92	0
Fire clay	2	0	94	0
Sand shale	11	0	105	0
Sandstone	1	0	106	0
Sand shale	33	0	139	0
Slate, black	0	10	139	10
Coal, Gilbert	0	5	140	3
Fire clay	3	5	143	8
Sand shale	17	4	161	0
Conglomerate	11	1	172	1
Sandstone, hard, **Lower Nuttall**	23	4	195	5
Shale, sandy	2	6	197	11
Coal, Hughes Ferry	0	4	198	3
Shale, dark	16	0	214	3
Shale, light	2	9	217	0
Shale, dark	29	0	246	0
Sandstone, soft	3	0	249	0
Shale, light	8	0	257	0
Shale, dark	20	0	277	0
Shale, light	15	0	292	0

	Thickness. Ft.	In.	Total. Ft.	In.
Sandstone, soft	4	0	296	0
Shale, dark	22	2	318	2
Sandstone, soft	5	3	323	5
Slate, black	1	6	324	11
Coal, Sewell "B"	0	3	325	2
Fire clay	0	9	325	11
Shale, dark	14	6	340	5
Coal ....0′ 4″ Binder ....0 2 **Coal** ....0 5 } **Sewell**	0	11	341	4
Sandstone, soft, base of Pottsville	16	0	357	4
Shale, light	10	0	367	4
Shale, dark	15	0	382	4
Shale, light	10	0	392	4
Sandstone, blue, hard	7	0	399	4
Shale, red	3	0	402	4
Shale, light	6	0	408	4
Sandstone, soft	15	0	423	4
Conglomerate	3	4	426	8
Sandstone, hard	1	3	427	11
Shale, green	1	6	429	5
Shale, red	3	0	432	5
Sandstone, blue	1	0	433	5
Shale, red	39	0	472	5
Shale, blue, sandy	72	0	544	5
Shale, red, to bottom	19	0	563	5

Three holes have been drilled recently on the eastern slope of Rich Mountain, the records of which have been furnished the Survey through the courtesy of Mr. M. D. Kirk, of the Davis Coal and Coke Company. Only one of these borings reached the Sewell Coal:

James Curtis No. 1 Coal Test Record (112A).

Roaring Creek District; on a branch of Roaring Creek, 1.5 miles southeast of Roaring Creek Junction; authority, Davis Coal and Coke Company; elevation, 2250′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface	5	6	5	6
Sandstone, **Upper Connoquenessing**	38	2	43	8
Shale, light, **Quakertown**	1	11	45	7
Coal, Quakertown	1	6	47	1
Fire clay	1	0	48	1
Shale, light, sandy	4	5	52	6
Shale, dark, sandy	16	0	68	6
Sandstone, with **coal** spars	2	2	70	8
Shale, dark	0	5	71	1
Sandstone	8	6	79	7
Shale, dark	0	2	79	9

	Ft.	In.		Thickness. Ft.	In.	Total. Ft.	In.
Sandstone with coal spars				25	4	105	1
Shale, dark				1	0	106	1
Sandstone				1	6	107	7
Slate. black				4	6	112	1
Shale, hard, sandy				0	10	112	11
Slate, dark				7	0	119	11
Sandstone				0	6	120	5
Black slate				1	0	121	5
Shale, dark, sandy				1	6	122	11
Fire clay, bastard				1	6	124	5
Shale, dark, sandy, hard				22	8	147	1
Sandstone				4	6	151	7
Shale, dark				2	0	153	7
Sandstone				6	6	160	1
Shale, dark				1	6	161	7
Sandstone with shale				3	0	164	7
Shale, dark, sandy				12	6	177	1
Sandstone with coal spars				9	2	186	3
Fine sandstone with slate				10	4	196	7
Shale and sandstone				0	8	197	3
Coal	0'	9"	Eagle..	6	10	204	1
Sulphur	0	0½					
Coal	0	2½					
Coal and bone	0	6					
Slate	3	4					
Coal, bony	0	1½					
Slate	0	1					
Coal	1	8					
Coal, bony	0	1½					
Fire clay				1	3	205	4
Bastard fire clay				2	0	207	4
Sandstone with shale streaks				3	0	210	4
Sandstone, fine, light				16	0	226	4
Sandstone with light slate				0	7	226	11
Sandstone, fine, hard				1	9	228	8
Coal	1'	9"	Gilbert	2	0½	230	8½
Coal, bony	0	3½					
Fire clay				1	4½	232	1
Sandstone				0	7	232	8
Shale, dark, sandy				15	6	248	2
Black slate				0	11	249	1
Coal, bony	0'	3½"	Hughes Ferry	2	10	251	11
Slate	1	1½					
Coal, bony	0	3					
Coal	1	2					
Slate				0	6	252	5
Sandstone, hard	24'	9"	Harvey(?)	61	10	314	3
Sandstone with shale streaks	24	6					
Conglomerate sandstone	12	7					
Shale and sand mixed				12	9	327	0

Maxwell and Crawford No. 2 Coal Test Record (112B).

Roaring Creek District; on a branch of Roaring Creek, 2.3 miles southeast of Roaring Creek Junction; authority, Davis Coal & Coke Co.; elevation, 2500′ B.

		Thickness. Ft.	In.	Total. Ft.	In.
Surface		18	0	18	0
Fire clay		5	6	23	6
Shale, dark, sandy		16	6	40	0
Sandstone with coal spars		7	0	47	0
Shale, dark, sandy		5	3	52	3
Coal 0′ 3″ Fire clay and shale 2 6 Bone 0 2 Coal 1 8½	Hughes Ferry	4	7½	56	10½
Slate		0	1½	57	0
Fire clay		0	10	57	10
Slate and bone		0	3	58	1
Fire clay		0	7	58	8
Coal		0	5	59	1
Bone		0	5	59	6
Fire clay		0	9	60	3
Conglomerate sandstone with coal spars full of coarse pebbles		16	3	76	6
Shale, black		11	6	88	0
Bone		0	5	88	5
Black slate and coal spars		0	3	88	8
Shale, dark		18	4	107	0
Bone and black slate		1	7	108	7
Shale, dark, sandy		15	11	124	6
Coal, Castle		0	8	125	2
Fire clay		6	2	131	4
Shale, dark, sandy		11	8	143	0
Shale, gray, sandy		5	9	148	9
Shale, dark		2	3	151	0
Fire clay and sandstone		3	6	154	6
Sandstone		2	11	157	5
Shale, dark, sandy		10	0	167	5
Fire clay		2	3	169	8
Coal 0′ 5″ Bone 0 3 Coal 0 10	Sewell "B"	1	6	171	2
Fire clay		1	6	172	8
Shale, dark, sandy		23	4	196	0
Coal 0′ 11″ Bone 0 7	Sewell	1	6	197	6
Bastard fire clay		3	6	201	0
Shale, dark, sandy, with sandstone streaks		23	0	224	0
Fire clay with coal spars		0	4	224	4
Fire clay and shale		2	8	227	0
Shale, dark, sandy, with sandstone streaks		5	6	232	6

				Thickness. Ft.	In.	Total. Ft.	In.
Sandstone, hard	10′	6″	Raleigh (Sharon)	50	6	283	0
Sandstone, coarse, pebbly, conglomerate	2	6					
Sandstone, conglomerate	13	5					
Shale, gray sandy	11	7					
Sandstone, hard, and gray shale	3	0					
Sandstone, hard	9	6					
Shale, green				7	0	290	0
Shale, red				3	0	293	0

Maxwell and Crawford No. 3 Coal Test Record (112C).

Roaring Creek District; on branch of Roaring Creek, 1.7 miles northeast of Coalton; authority, Davis Coal & Coke Co.; elevation, 2540′ B.

				Thickness. Ft.	In.	Total. Ft.	In.
Surface and boulders				40	0	40	0
Sandstone, brown				3	0	43	0
Coal, bony, and slate, **Quakertown "Rider"**				0	2	43	2
Shale, dark	10′		**Quakertown**	13	0	56	2
Slate, black	3						
Coal, Quakertown				0	5	56	7
Fire clay with streaks				3	0	59	7
Fire clay				7	0	66	7
Shale, dark				2	0	68	7
Sandstone				20	0	88	7
Coal	1′	11″	**Cedar Grove**	3	1	91	8
Fire clay	0	5					
Coal, bony	0	2					
Coal	0	1					
Bony and slate	0	1					
Coal	0	5					
Fire clay				0	4	92	0
Shale, gray				1	8	93	8
Sandstone				53	4	147	0
Sandstone with **coal** spars				0	3	147	3
Shale, dark				1	9	149	0
Fire clay				2	6	151	6
Coal, Campbell Creek (No. 2 Gas)				0	8	152	2
Fire clay, very soft				0	10	153	0
Shale, dark, sandy				1	4	154	4
Conglomerate sandstone with black pebbles				0	9	155	1
Shale, black				30	6	185	7
Shale, black, with sandstone pebbles				0	5	186	0
Shale, black				4	0	190	0

				Thickness.		Total.	
				Ft.	In.	Ft.	In.
Fire clay, very soft				1	10	191	10
Shale, dark, sandy				0	10	192	8
Hard fire clay				2	4	195	0
Coal	1′	8″	Powellton	5	1	200	1
Fire clay	0	8					
Coal	0	3					
Fire clay with coal streaks	0	4					
Coal	0	4					
Bony and slate	0	6					
Coal	0	4					
Bony coal and slate	1	0					
Fire clay				2	0	202	1
Slate, black, with coal bands				1	0	203	1
Shale, light, sandy, with coal slips				6	0	209	1
Fire clay				0	4	209	5
Shale, light, sandy				12	10	222	3
Sandstone				8	6	230	9
Fire clay with coal slips				2	3	233	0
Conglomerate sandstone				1	2	234	2
Slate, black				1	10	236	0
Slate, black, with coal streaks				2	7	238	7
Shale, dark, sandy				8	4	246	11
Bony coal	0′	4″	Eagle	3	5	250	4
Coal	0	10					
Coal with sulphur bands	0	6					
Coal	0	3½					
Bone	0	2½					
Coal	0	1					
Bony and slate	0	4					
Coal	0	1					
Slate	0	1					
Coal	0	2					
Bony and slate	0	4					
Mother coal	0	0½					
Coal	0	1½					
Bony and slate				0	2	250	6
Sandstone and slate bands				0	2	250	8
Sandstone				0	7	251	3
Slate				0	2	251	5
Sandstone				3	7	255	0

DETAILED COAL TEST RECORDS, MIDDLE FORK DISTRICT, RANDOLPH.

In Middle Fork District, 21 holes have been put down for coal, the records of most of which have been preserved. Four of these were bored along the Middle Fork River between Cassity and West Huttonsville, by Hon. S. B. Elkins of whom the Davis Colliery Company is now the financial successor in this region. The **Andrew Currence No. 11 (114) Boring,** located on Three Forks Run, 0.8 mile southwest of Cassity, starts near the base of the Pottsville, and found only the Sewell Coal. Its record was previously published in Volume II, page 623, of the Survey, and has been used in connection with the section for Cassity, page 170, of the present Report.

The following is the record of a valuable test made on a branch of Cassity Fork, starting 100 feet below the top of the Homewood Sandstone, and penetrating the Pottsville nearly to the base of the Raleigh (Sharon) Sandstone, and being therefore within about 25 feet of the Mauch Chunk Reds. An examination of the core was made by the writer in an attempt to find the fossils of the Eagle Shale but none were seen although the shale was noted in typical character and appearance:

Cassity Fork Boom & Lumber Company Coal Test No. 1 (114A).

Middle Fork District; on Josh Fork of Cassity Fork of Middle Fork River, 2.8 miles northeast of Cassity; authority, Alan Wood Iron & Steel Company; elevation, 2520′ B.; completed, November 25, 1917.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Sand and boulders................	3	0	3	0
Fire clay........................	2	0	5	0
Sandstone, hard..45′ Sandstone, broken .....21 Shale, sandy.....14 Sandstone ......33 Upper Connoquenessing..	113	0	118	0
Shale, dark, Quakertown..........	4	0	122	0
Sandstone ......36′ Shale, gray......14 Sandstone ......54 Lower Connoquenessing..	104	0	226	0
Shale, gray......................	2	0	228	0
Sandstone	7	0	235	0
Shale, dark......................	4	1	239	1
Coal, Chilton....................	0	11	240	0
Shale, gray......................	50	0	290	0

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Sandstone, shaly	32	0	322	0
Shale, sandy	7	0	329	0
Shale, dark	21	6	350	6
Shale, black	0	10	351	4
Coal, Campbell Creek (No. 2 Gas)	2	4	353	8
Shale, dark	21	4	375	0
Sandstone, shaly	21	0	396	0
Shale, dark	1	0	397	0
Sandstone	18	0	415	0
Shale, sandy	6	0	421	0
Shale, dark	25	6	446	6
Slate, black	0	4	446	10
Coal ....0′ 9″ Shale, gray....0 3 Coal ....0 5 } Eagle	1	5	448	3
Fire clay	3	4	451	7
Shale, dark	0	10	452	5
Fire clay	2	6	454	11
Shale, sandy	5	1	460	0
Shale, dark, Eagle	27	0	487	0
Coal, Gilbert	0	6	487	6
Fire clay	3	6	491	0
Shale, dark	13	0	504	0
Shale, sandy	4	0	508	0
Sandstone, Nuttall	40	0	548	0
Shale, dark	13	0	561	0
Shale, sandy	1	0	562	0
Sandstone, Harvey	21	0	583	0
Shale, sandy	8	0	591	0
Shale, dark	3	6	594	6
Sandstone, Guyandot	20	6	615	0
Shale, dark	30	0	645	0
Shale, sandy	16	0	661	0
Sandstone	3	3	664	3
Coal, Sewell	0	3	664	6
Shale, dark, with coal partings	1	6	666	0
Sandstone, Welch	37	0	703	0
Shale, dark, Welch Coal horizon	1	0	704	0
Sandstone	4	0	708	0
Shale, sandy	15	0	723	0
Shale, dark, broken	13	0	736	0
Fire clay	3	0	739	0
Sandstone, hard....33′ Sandstone, with large quartz pebbles..11 } Raleigh (Sharon)	44	0	783	0

The following test was made a short distance farther down the same fork of Cassity:

Cassity Fork Boom & Lumber Company No. 2 Coal Test Record (114B).

Middle Fork District; on Josh Fork of Cassity Fork, 1.6 miles northeast of Cassity; authority, Alan Wood Iron & Steel Company; elevation, 2145′ B.; completed in December, 1917.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Boulders and sand	13	0	13	0
Shale, sandy	1	6	14	6
Coal, Campbell Creek (No. 2 Gas)	3	3	17	9
Fire clay	3	3	21	0
Shale, sandy	5	0	26	0
Shale, dark	5	0	31	0
Coal, Powellton	2	0	33	0
Fire clay	5	0	38	0
Shale, dark	2	0	40	0
Fire clay	5	0	45	0
Shale, sandy	39	0	84	0
Sandstone	16	0	100	0
Shale, dark	35	0	135	0
Sandstone, shaly, broken	9	6	144	6
Coal, Eagle	1	6	146	0
Fire clay	4	0	150	0
Shale, sandy	27	0	177	0
Sandstone, shaly	13	0	190	0
Coal, Gilbert	1	4	191	4
Fire clay	1	8	193	0
Shale, sandy	17	0	210	0
Fire clay	2	0	212	0
Shale, dark, with coal partings	4	0	216	0
Sandstone, **Nuttall**	29	0	245	0
Shale, dark	13	0	258	0
Shale, sandy	10	3	268	3
Coal, Castle	0	5	268	8
Shale, dark, sandy	11	4	280	0
Shale, sandy	10	0	290	0
Shale, dark	46	0	336	0
Shale, dark, sticky	2	0	338	0
Coal, Sewell	1	0	339	0
Shale, dark	13	0	352	0
Coal, Welch	0	5	352	5
Slate	0	6	352	11
Fire clay	2	0	354	11
Shale, sandy	2	0	356	11
Sandstone, hard, pebbly, **Raleigh (Sharon)**	14	1	371	0

The following test was made east of the Belington Syncline where the rocks are rising rapidly toward the crest of Rich Mountain:

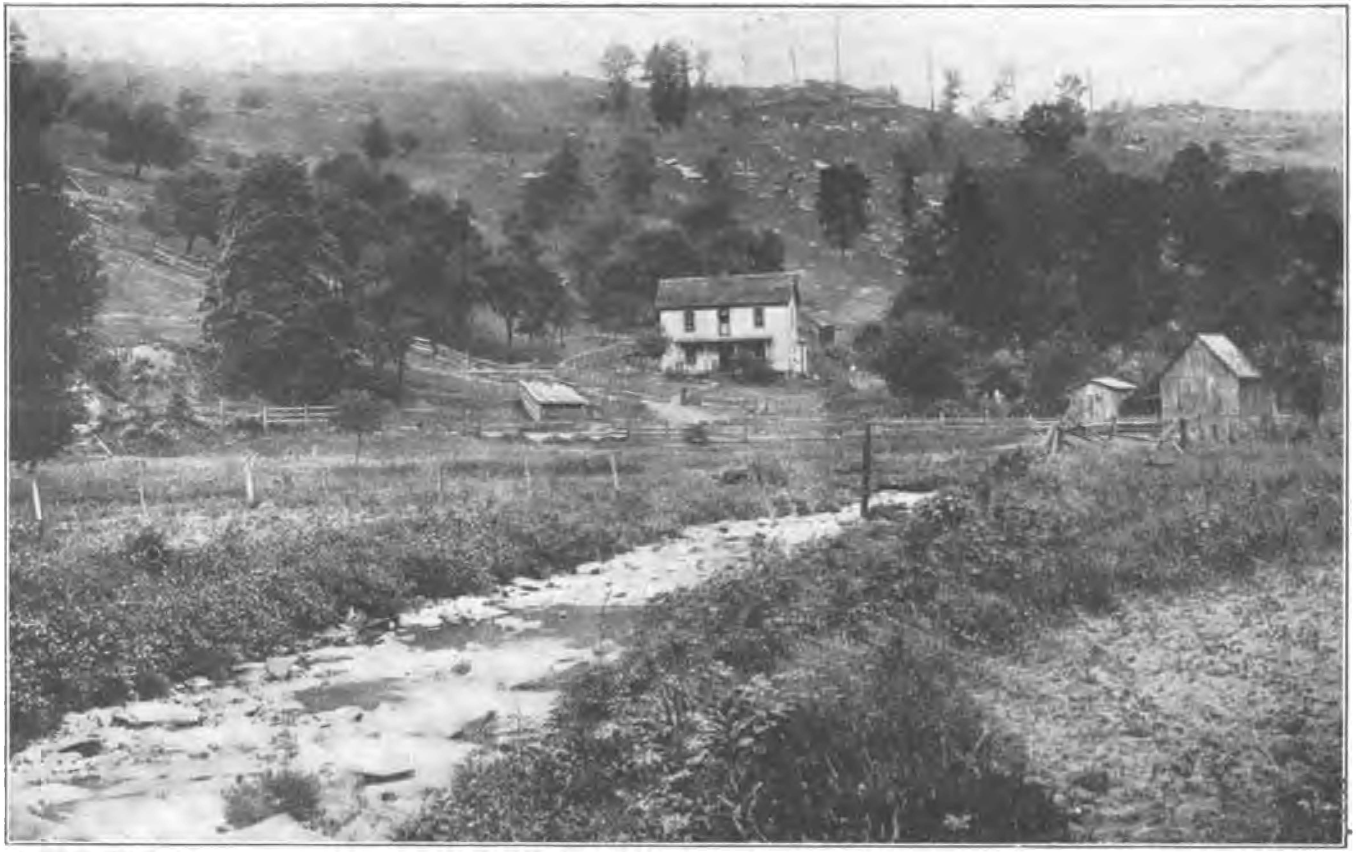

PLATE XXIV.—View on Sand Run, just southwest of Overhill, Upshur County, showing Mahoning Sandstone at top and entire Allegheny Series below, the Lower Kittanning Coal being opened at left.

Cassity Fork Boom & Lumber Company No. 3 Coal Test Record (114C).

Middle Fork District, on Panther Fork of Cassity Fork, 4 miles southwest of Cassity; authority, Alan Wood Iron and Steel Company; elevation, 2765′ B; completed in January, 1918.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Sand, gravel and boulders	19	0	19	0
Sand and gravel	7	5	26	5
Sandstone } Brownstown	75	7	102	0
Conglomerate } Brownstown	2	0	104	0
Fire clay	1	0	105	0
Sandstone	4	0	109	0
Conglomerate	1	0	110	0
Sandy shale	19	0	129	0
Fire clay	2	0	131	0
Sandy shale	24	0	155	0
Dark shale	2	0	157	0
Sandy shale	9	0	166	0
Fire clay	2	0	168	0
Sandy shale	33	0	201	0
Dark shale	8	4	209	4
Coal, Eagle	1	8	211	0
Fire clay	4	0	215	0
Dark shale	2	0	217	0
Sandy shale	8	0	225	0
Dark shale with sandy partings	8	0	233	0
Dark shale	40	7	273	7
Coal ....0′ 11″ Sandy fire clay..1 6 Shale ....1 4 **Coal** ....1 0 } **Gilbert**	4	9	278	4
Shale	15	8	294	0
Dark shale	1	0	295	0
Coal, Hughes Ferry	1	0	296	0
Fire clay	2	0	298	0
Dark shale with coal partings	2	0	300	0
Dark shale	5	0	305	0
Sandstone	14	0	319	0
Hard broken sandstone	15	0	334	0
Hard dark slate and shale	21	0	355	0
Dyke rock (?) 8′ Sandstone ....20 } **Lower Nuttall**	28	0	383	0
Broken, dark shale	48	0	431	0
Sandy shale, with coal partings at base, **Sewell "B"**	18	0	449	0
Hard broken shale	2	0	451	0
Gray shale	21	0	472	0
Sandstone	7	8	479	8

	Thickness. Ft.	In.	Total. Ft.	In.
Coal, Sewell	1	8	481	4
Fire clay	0	6	481	10
Gray shale	8	2	490	0
Sandy shale	4	0	494	0
Sandstone	5	0	499	0
Sandy shale	5	0	504	0
Gray shale	7	8	511	8
Dark shale, **coal** partings, **Welch**	1	4	513	0
Dark shale	2	0	515	0
Hard sandstone..16' 0" Conglomerate sandstone ...16 0 Sandstone ...... 9 6 Sandy shale..... 9 6 Sandstone ......25 0 **Raleigh (Sharon)**	76	0	591	0

The following record was formerly published in Volume II, page 623, of the Survey:

Womelsdorff Heirs No. 12 Coal Test Boring (115).

Middle Fork District; on Stonecoal Run, 2.5 miles southward from Cassity; authority, Davis Colliery Company; elevation, 2170' B.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface, boulders, and sand	11	0	11	0
Sandstone, gray, streaks of slate	10	1	21	1
Sandstone, gray	6	3	27	4
Slate, spotted with gray sandstone	5	3	32	7
Fire clay	4	0	36	7
Slate and fire clay	13	3	49	10
Bone coal	0	2	50	0
Fire clay, very soft	6	3	56	3
Slate and sandstone, mixed	9	5	65	8
Coal, Hughes Ferry	0	3	65	11
Sandstone and streaks of fire clay	9	0	74	11
Fire clay, slaty, little streaks of gray sandstone	38	6	113	5
Slate	37	2	150	7
Coal, slate mixed, **Castle**	2	4	152	11
Fire clay and slate, mixed, very soft	6	1	159	0
Sandstone and fire clay, mixed	25	2	184	2
Sandstone, gray	5	0	189	2
Fire clay, very soft	2	0	191	2
Coal, very good, **Sewell**	4	1½	195	3½
Fire clay and slate	20	1½	215	5
Sandstone and fire clay	4	2	219	7

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Sandstone, gray	18	2	237	9
Fire clay, spongy, very hard to drill	3	8	241	5
Sandstone, gray, very hard	2	7	244	0
Sandstone, gray, and lime, mixed	1	8½	245	8½
Sandstone, gray	9	3	254	11½
Fire clay and sandstone, mixed	1	11	256	10½
Sandstone, gray, trace of coal at bottom	5	0	261	10½
Slate, sandy, full of seams, broken up	6	2½	268	1
Sandstone, gray. 22′ 7″ Sandstone, gray, and pea conglomerate ..42 0 } Raleigh (Sharon).	66	7	332	8
Fire clay, sandy and spongy, very hard to drill	7	0	339	8
Fire clay, broken up and would not make core	3	1	342	9
Sandstone, gray, with pea conglomerate, very hard	18	10	361	7
Sandstone, conglomerate, mixed, hard	15	11	377	6
Sandstone, very hard	9	8	387	2
Sandstone and fire clay, mixed, to red beds	5	6	392	8

The record of the **John Fincham No. 14 (116) Boring,** located at the mouth of Laurel Branch of Middle Fork, 1.7 miles northward from Adolph, and previously published in Volume II, page 624, of the Survey, is published in the present Report in connection with the section for Laurel Branch of Middle Fork, page 173.

The record of the **K. E. Zickefoose No. 13 (117) Boring,** located at Adolph on the Middle Fork River, was previously published in Volume II, page 625, of the Survey. In the present Report, it is published in connection with the section for Adolph, page 175.

Eleven holes have been bored along the Left Fork of Buckhannon River on land that is now the property of the Elkhorn Coal Corporation. The following is the record of one of these borings:

Elkhorn Coal Corporation No. 2 Coal Test Boring (119).

Middle Fork District; on Lower Dry Run of Buckhannon River, 2.4 miles southeast of Palace Valley; authority, Elkhorn Coal Corporation; elevation, 2865′ B.

				Thickness. Ft.	Thickness. In.	Total. Ft.	Total. In.
Surface				19	0	19	0
Slate				23	6	42	6
Shale				2	8	45	2
Slate				8	1	53	3
Slate and coal	0′	10″	Hughes Ferry.	4	6	57	9
Coal and slate streaks	1	5					
Slate	1	2⅛					
Coal	1	0½					
Fire clay				5	6	63	3
Shale				15	7	78	10
Sandstone, Middle Iaeger				29	6	108	4
Slate				14	0	122	4
Fire clay				0	5	122	9
Coal, Lower Iaeger				0	3	123	0
Fire clay				5	6	128	6
Slate				2	5	130	11
Shale				2	4	133	3
Sandstone				1	0	134	3
Soapstone				6	0	140	3
Shale				8	0	148	3
Slate				7	4	155	7
Shale				6	11	162	6
Slate				3	0	165	6
Coal, Sewell "B"				0	3	165	9
Fire clay				10	6	176	3
Sandstone, Lower Guyandot				17	3	193	6
Slate				3	0	196	6
Coal	1′	8″	Sewell	7	11	204	5
Fire clay	3	0					
Slate	2	9					
Coal	0	6					
Fire clay				2	4	206	9
Shale				4	0	210	9
Slate				6	7	217	4
Sandstone, Raleigh (Sharon)				103	4	320	8
Shale				2	10	323	6
Sandstone				4	8	328	2
Slate				7	3	335	5
Slate and coal				3	7	339	0
Sandstone				11	0	350	0

The record of the **Elkhorn Coal Corporation No. 1 (120) Boring**, located along the Buckhannon River, 0.6 mile south of Palace Valley, is published in connection with the section for that place, page 159.

The nine following records are of holes drilled on the tract formerly owned by the Rich Mountain Coal Company, but now the property of the Elkhorn Coal Corporation, as previously mentioned:

Elkhorn Coal Corporation No. 9 Coal Test Record (121).

Middle Fork District; on the waters of Beech Run, 0.4 mile south of Beech Run town; authority, Elkhorn Coal Corporation; elevation, 3055′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface	10	0	10	0
Shale	15	0	25	0
Shale and sandstone partings	131	0	156	0
Shale	106	6	262	6
Coal, Castle	0	4	262	10
Shale	28	2	291	0
Sandstone	2	0	293	0
Shale	35	0	328	0
Sandstone, Guyandot	26	0	354	0
Shale	5	0	359	0
Bone	0	1	359	1
Coal, Sewell "B"	0	7	359	8
Shale	1	0	360	8
Sandstone	1	6	362	2
Shale	1	0	363	2
Sandstone	0	3	363	5
Shale	0	2	363	7
Coal, Sewell	2	6	366	1
Shale	8	11	375	0

Elkhorn Coal Corporation No. 3 Coal Test Record (122).

Middle Fork District; on Beech Mountain, 0.8 mile southwest of Beech Run; authority, Elkhorn Coal Corporation; completed, August 2, 1909; elevation, 3350′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Gravel and boulders	18	0	18	0
Sandstone	67	0	85	0
Shale	9	0	94	0
Sandstone	9	0	103	0
Sand shale	50	0	153	0
Sandstone, Eagle (?)	55	0	208	0
Sand and shale	148	0	356	0
Shale	58	0	414	0
Coal, Hughes Ferry	0	6	414	6
Shale	44	6	459	0
Coal, Lower Iaeger	0	3	459	3
Shale	41	0	500	3
Sandstone	58	9	559	0

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Slate	3	0	562	0
Coal, Sewell "B"	0	5	562	5
Shale	15	7	578	0
Sandstone, Lower Guyandot	7	0	585	0
Shale	2	0	587	0
Coal, Sewell	1	11	588	11
Fire clay	8	1	597	0
Slate	0	5	597	5
Sandstone, Raleigh (Sharon)	15	0	612	5
Shale	1	7	614	0
Red shale	3	0	617	0
Gray shale	5	0	622	0
Red and green shale	34	0	656	0
Sandstone	21	0	677	0

Elkhorn Coal Corporation No. 4 Coal Test Record (123).

Middle Fork District; on Beech Run, 1.2 miles northeast of Hartridge; authority, Elkhorn Coal Corporation; completed, August 28, 1909; elevation, 2945′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface	21	0	21	0
Coal, Hughes Ferry	1	1	22	1
Shale	17	11	40	0
Coal, Lower Iaeger	0	3	40	3
Shale	25	0	65	3
Coal, Castle	0	3	65	6
Shale	65	0	130	6
Sandstone	2	6	133	0
Shale	1	0	134	0
Bone coal	0	3	134	3
Slate	2	0	136	3
Sandstone, Guyandot	17	6	153	9
Slate	0	6	154	3
Coal	0	10	155	1
Shale	8	0	163	1
Coal, Sewell "B"	1	0	164	1
Fire clay	4	4	168	5
Shale	3	4	171	9
Sandstone	6	2	177	11
Sand shale	3	0	180	11
Sandstone	4	0	184	11
Shale	6	1	191	0
Coal ......3′ 5″ Slate ......0 2 Coal ......0 1 } Sewell	3	8	194	8
Shale	10	4	205	0

Elkhorn Coal Corporation No. 6 Coal Test Record (124).

Middle Fork District; on Left Fork of Buckhannon River, 1.1 miles northeast of Hartridge; authority, Elkhorn Coal Corporation; completed, September 24, 1909.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface	24	0	24	0
Shale	12	0	36	0
Sandstone	2	0	38	0
Shale	85	0	123	0
Sandstone	2	0	125	0
Shale	1	0	126	0
Sandstone	3	0	129	0
Conglomerate	7	0	136	0

"The writer is still of the opinion that this hole was started too far down the hill. No. 5 hole shows just about 100 feet from coal to conglomerate which would bring the coal in this hole where we went through the surface." (Extract from letter of T. B. Sturges, General Manager, J. A. Brennan Drilling Company).

Elkhorn Coal Corporation No. 5 Coal Test Record (125).

Middle Fork District; on Beech Run, 1.6 miles south of Beech Run village; authority, Elkhorn Coal Corporation; completed, September 9, 1909; elevation, 2945′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface	23	0	23	0
Coal, Hughes Ferry	2	0	25	0
Shale	42	0	67	0
Coal, Lower Iaeger	1	3	68	3
Fire clay	3	0	71	3
Shale	12	9	84	0
Sandstone	3	0	87	0
Shale	10	0	97	0
Coal, Castle	0	3	97	3
Shale	27	9	125	0
Sandstone, **Guyandot**	40	0	165	0
Shale	10	0	175	0
Coal	0	4	175	4
Slate	0	5	175	9
Coal	0	2	175	11
Shale	8	8	184	7
Coal, Sewell "B"	1	2	185	9
Slate	0	4	186	1
Shale	15	11	202	0
Coal, Sewell	2	2	204	2
Shale	35	10	240	0
Sandstone	3	0	243	0
Shale	21	0	264	0
Red and green shale	12	0	276	0
Sandstone	28	0	304	0
Conglomerate	4	0	308	0

Elkhorn Coal Corporation No. 7 Coal Test Record (126).

Middle Fork District; on Beech Run, 1.8 miles south of Beech Run village; authority, Elkhorn Coal Corporation; elevation, 2870′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface	6	0	6	0
Sandstone, **Guyandot**	50	0	56	0
Shale	4	0	60	0
Coal, Sewell "B"	1	0	61	0
Fire clay	5	0	66	0
Sandstone, **Lower Guyandot**	15	0	81	0
Shale	5	0	86	0
Coal, Sewell	2	8	88	8
Fire clay	1	4	90	0

Elkhorn Coal Corporation No. 8 Coal Test Record (127).

Middle Fork District; on Beech Run, 2.1 miles south of Beech Run village; authority, Elkhorn Coal Corporation; completed, November 9, 1909; elevation, 2935′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Boulders and gravel	30	0	30	0
Sandstone	1	0	31	0
Shale	21	0	52	0
Sandstone	15	0	67	0
Shale	33	0	100	0
Sandstone	40	0	140	0
Shale	1	0	141	0
Sandstone	12	0	153	0
Shale	3	0	156	0
Sandstone, **Guyandot**	18	0	174	0
Shale	9	0	183	0
Coal, Sewell "B"	0	6	183	6
Shale	17	6	201	0
Coal, Sewell	3	0	204	0
Shale	13	0	217	0

The record of the **Elkhorn Coal Corporation No. 1 (128) Boring,** located on Beech Mountain, 0.4 mile southeast of Hartridge, is published in connection with the section for the latter place, page 177.

Elkhorn Coal Corporation No. 2 Coal Test Record (129).

Middle Fork District; on Left Fork of Buckhannon River, 0.3 mile southeast of Hartridge; authority, Elkhorn Coal Corporation; completed, April 30, 1909; elevation, 3175′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface	6	0	6	0
Shale	3	0	9	0

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Sandstone	24	6	33	6
Shale	2	6	36	0
Sandstone	3	0	39	0
Shale	24	0	63	0
Bone	0	2	63	2
Coal, Eagle (?)	0	6	63	8
Shale	25	4	89	0
Sandstone, Upper Gilbert	32	0	121	0
Shale	2	0	123	0
Coal, Gilbert	0	8	123	8
Shale	70	4	194	0
Coal, Hughes Ferry	1	4	195	4
Shale	38	0	233	4
Coal, Lower Iaeger	1	1	234	5
Shale	28	7	263	0
Sandstone	2	0	265	0
Shale	26	0	291	0
Sandstone	19	0	310	0
Shale	17	0	327	0
Sandstone, Guyandot	10	0	337	0
Shale	2	0	339	0
Coal, Sewell "B"	0	3	339	3
Shale	27	9	367	0
Coal, Sewell	3	1	370	1
Shale	3	11	374	0

The following record was furnished the Survey by U. L. Brennan, of Green Grove, Pennsylvania, and is that of a hole bored on land now the property of the Buckhannon Chemical Company:

Buckhannon Chemical Co. No. 1 Coal Test Record (130).

Middle Fork District; at the forks of Buckhannon River just south of Newlon; authority, Buckhannon Chemical Company; completed in 1891; elevation, 1905′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Sandstone	26	5	26	5
Slate, brown	3	0	29	5
Slate, very black	69	7	99	0
Sandstone	46	0	145	0
Slate rock and sandstone	74	0	219	0
Sandstone	50	4	269	4
Slate rock	30	10	300	2
Sandstone	19	10	320	0

The following is the record of a churn drill hole furnished the Survey by J. A. McCauley, of Silica:

J. A. McCauley No. 1 Coal Test Record (131).

Middle Fork District; on Buckhannon River, at Silica; authority, Cutright Brothers; elevation, 2335' B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Unrecorded	8	0	8	0
Sandstone	4	0	12	0
Coal, Eagle	4	0	16	0

According to Dr. J. L. Cunningham, of Pickens, the **Holly Lumber Company Water Well (132)**, drilled on its property at the Pickens mill, found 4 feet of coal at a depth of 56 feet, which would correlate with the Eagle seam. It is much to be regretted that no hole has ever been bored to test the Sewell Coal in this vicinity.

DETAILED COAL TEST RECORDS, HUTTONSVILLE AND MINGO DISTRICTS, RANDOLPH.

Three holes (Nos. 133, 134, and 135 on Map IV) were once bored on the **Ward and Hutton** property on the watershed between Tygart Valley and Back Fork of Elk Rivers, one of which was located in Huttonsville District and the other two in Mingo. All of these tests were started at a level high enough to test the Sewell Coal under the southern end of Rich Mountain, but the records of these borings could not be obtained.

MINABLE COALS OF THE MONONGAHELA SERIES.

REDSTONE COAL.

The Redstone Coal, discussed previously in Chapter V, page 197, and shown by outcrop lines on Maps II and IV in those regions where it occurs in minable thickness above drainage, is a valuable bed of fuel in western Barbour and northern Upshur, having been mined commercially at three points. It is not found in Randolph as its horizon is everywhere above the hilltops. In those portions of Barbour and Upshur where it occurs, it is from 3 to 6 feet in thickness, and usually carries no slate partings but is sometimes damaged by clay seams that cross it in some of the mines. Its chemical composition shows it to be a fine coal for steam and domestic fuel and in some regions the sulphur content is low enough to permit its use for coke manufacture. Figure 4 shows its probable minable extent.

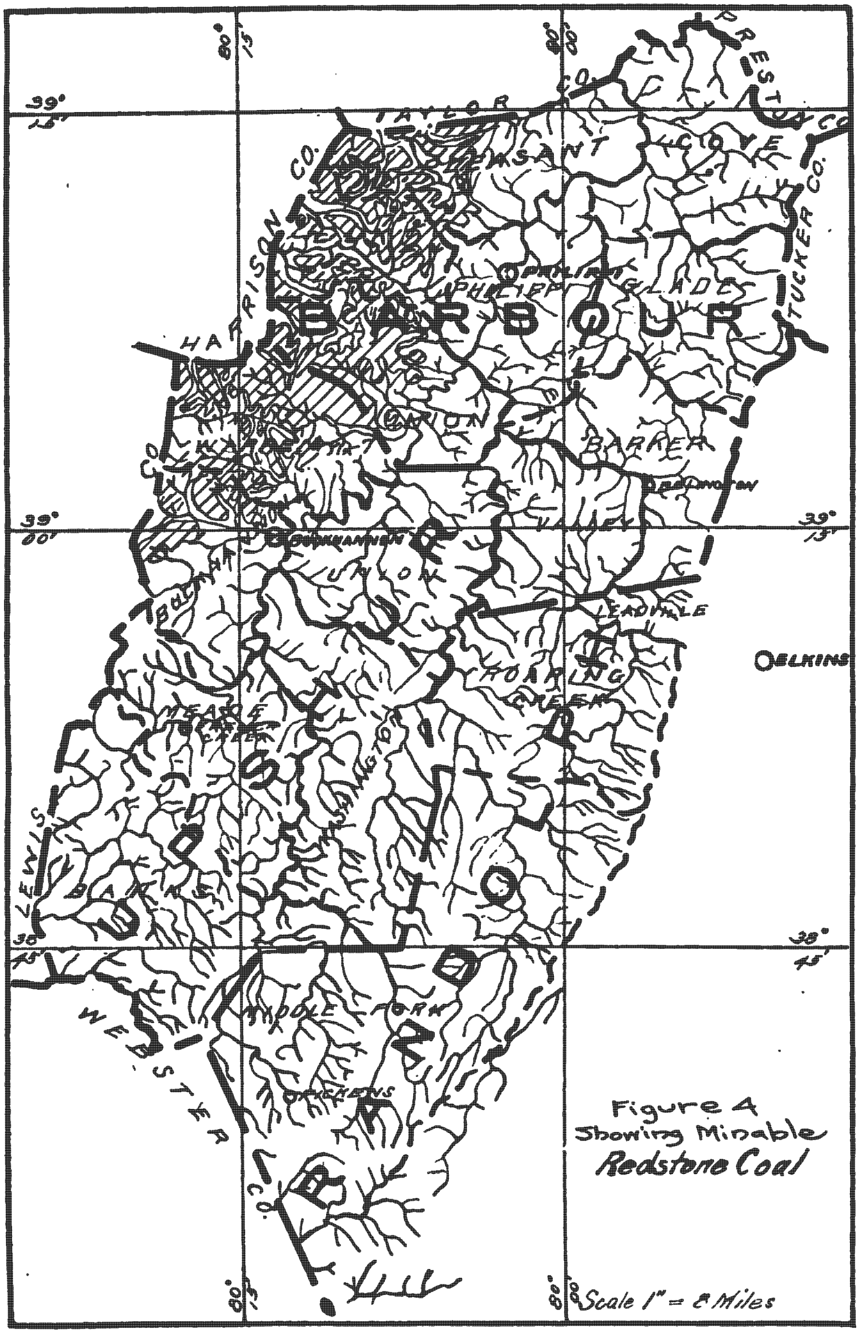

Figure 4
Showing Minable
Redstone Coal

Scale 1" = 8 Miles

Redstone Coal, Pleasant District, Barbour.

In Pleasant District, the Redstone Coal is above drainage along the principal streams. In the western part, next to Harrison, it is well down toward the foot of the hills, but it rises gradually eastward until at Berryburg it is near the tops and a few miles farther east disappears entirely above the ridges. It has not been mined commercially in the District and has been seldom used for domestic fuel, as the Pittsburgh Coal is thicker and more easily mined than the Redstone and has prevented any extensive exploitation of the latter seam in this locality. The coal is noted by Teets along the public road at the head of Foxgrape Run, at **Coal Exposure No. 2 on Map II,** 1.8 miles northeast of Berryburg, being 3 feet thick at an elevation of 1565′ B.

Redstone Coal, Elk District, Barbour.

In Elk District the Redstone Coal crops well up in the hills along the western edge next to Harrison County, and rises gradually eastward until it disappears above the hilltops two miles west of Philippi. It has not been prospected extensively as the Pittsburgh Coal lies below it and is thicker and more easily accessible. There are no commercial mines in the District, the coal having been used only for domestic fuel.

The coal is reported by Teets at the **D. G. Hudkins Farm Mine (No. 3 on Map II),** on Elk Creek, 2.3 miles east of Overfield, where it is 5′ 3″ thick, without slate partings. A sample was collected for analysis the composition of which is given under **Mine No. 3** in the table of coal analyses at the end of this Chapter.

At the **Cecil Radcliff Farm Mine (No. 4 on Map II),** on Brushy Fork of Elk, 0.9 mile southeast of Pepper, the coal had once been opened at an elevation of 1335′ B., but the place had fallen shut when it was examined by Teets. He reports the following structure at another opening farther east:

Coney Corder Farm Mine—No. 5 on Map II.

On the head of Hackers Creek, 1.3 miles southwest of Berryburg; Redstone Coal; elevation, 1485′ B.

			Ft.	In.
Coal (slate roof)	2′	0″		
Slate	0	4		
Coal	1	1	3	5

Redstone Coal, Union District, Barbour.

In Union District, the Redstone Coal crops in the hills of the western and central portion, but in the eastern part, next to the Tygart Valley River, the eastward rise of the rocks takes its horizon above the summits. It has been mined commercially at Century where the high topographic level of Big Run permits it to be worked by shaft. It has been mined at numerous points also for domestic fuel and many of these openings are still in use as the following details, secured by Teets, will show:

The **Oard Bean Farm Mine (No. 6 on Map II)**, located on Peeltree Run, 0.9 mile northeast of Peeltree village, shows 5′ 0″ of clean coal, at an elevation of 1290′ B.

The **Oran Martin Farm Mine (No. 7 on Map II)**, located on Peeltree Run, 1.2 miles northeast of Peeltree, shows 4′ 10″ of clean coal, at an elevation of 1275′ B.

The **Frank White Farm Mine (No. 8 on Map II)**, on Dick Drain of Gnatty Creek, 1 mile south of Peeltree, measured 4′ 8″ of clean coal, at an elevation of 1265′ B.

The **Roy White Farm Mine (No. 9 on Map II)**, on Right Branch of Gnatty Creek, 0.7 mile northwest of Century, shows 5′ 1″ of clean coal, at an elevation of 1285′ B.

The **Lillian and May White Farm Mine (No. 10 on Map II)**, on Right Branch of Gnatty Creek, 0.7 mile northwest of Century, measures 4′ 11″ of clean coal, at an elevation of 1280′ B.

As stated previously, the coal has been long and successfully mined by shaft at Century where its base is at a depth of 157 feet below surface, making its tidal elevation 1306′ L. This mine was once visited and sampled by A. P. Brady, a former member of the Survey Staff, and the information secured by him is published in Volume II, page 161, of the Survey Reports. The following are Mr. Brady's section of the mine:

Century Coal Company, No. 1 Mine—No. 11 on Map II.

On Big Run at Century; Redstone Coal; elevation of base of coal, 1266' L.

			Ft.	In.
Slate				
Draw slate			1	0
Coal	0'	7"		
Bone coal	0	0½		
Coal	4	9½	5	5

"Principal office, 10 South St., Baltimore, Md.; daily capacity, 1600 tons; output, 1500 to 1600 tons; 45 laborers and 160 miners employed; used for steam and domestic fuel; shipped in all directions; butts, N. 78° W.; faces, N. 12° E.; greatest rise, S. 50° E.; sample collected from southwest side of mine on C Heading by A. P. Brady." (These data revised to 1915, D. B. R.).

The composition of this sample is published under **No. 11** in the table of coal analyses at the end of this Chapter. Another section was measured and a sample taken by Mr. Brady from the northeast side of the mine, "A" Heading, Room No. 2, as follows:

			Ft.	In.
Sand rock				
Slate				
Bone coal	0'	4"		
Coal	5	0		
Slate	0	0⅛		
Coal	0	7	5	11⅛

The composition of this sample is published under **No. 11** in the table of coal analyses at the end of this Chapter. Concerning the character of this coal, Dr. I. C. White makes the following statement in the citation noted above:

> "These analyses reveal a coal of fine quality, which comes out of the mine in handsome cubical blocks, stands shipment well, and has already established a fine reputation for itself as a steam and general fuel coal of the highest excellence. It has an excellent roof, much better than the underlying Pittsburgh bed."

The Century Company has recently opened another mine, located farther east along the same stream, where the coal is above drainage and can be mined by drift, as is shown by the following:

Century Coal Company, No. 2 Mine—No. 12 on Map II.

On Big Run, 1.5 miles east of Century; **Redstone Coal**; elevation, 1455′ B.

	Ft.	In.
Coal (with slate roof and floor)................	5	6½

"Principal office, 10 South St., Baltimore, Md.; daily capacity, 1,200 tons; output, 1,000 tons; 30 laborers and 80 miners employed; electric haulage; coal shipped in all directions for steam and domestic fuel; greatest rise, southeast; sample collected from F southwest heading by D. D. Teets, Jr.; John Phillips, Superintendent, authority for mine data."

The composition of this sample is published under Mine No. 12 in the table of coal analyses at the end of this Chapter.

The **Anna Lance Farm Mine (No. 13 on Map II)**, located on Big Run, 1.5 miles northwest of Volga, measures 5′ 1″ of clean block coal, at an elevation of 1520′ B.

The **Benjamin Clevenger Farm Mine (No. 14 on Map II)**, located on Rock Run, 1.5 miles northwest of Volga, shows 5′ 0″ of clean coal at an elevation of 1545′ B. A sample was collected, the composition of which is published under **Mine No. 14** in the table of coal analyses at the end of this Chapter.

Redstone Coal, Philippi District, Barbour.

In Philippi District, only a few acres of Redstone Coal are found, being located in the extreme western end along the district line. At **Coal Exposure No. 15 on Map II**, on the ridge south of Hackers Creek, Teets noted 4′ 9″ of clean coal, at an elevation of 1675′ B. So far as known the coal is not opened and mined in the District.

Redstone Coal, Warren District, Upshur.

In Warren District, the Redstone Coal reaches its best development in the State, being found in the hills along Hackers Creek, Pecks Run, Turkey Run, and other streams, and having a thickness of 4 to 6 feet, and being practically free from slate partings. There are no commercial mines but the coal is used extensively for domestic fuel. In the extreme southeastern end of the District, it is not found as its horizon is above the tops of the hills.

In the extreme northern end of the District, this coal has been opened at several points along Charity Fork of Gnatty Creek, according to Teets. The **W. D. Arnold Farm Mine (No. 16 on Map IV)**, located 1.5 miles west of Century, shows 5′ 5″ of clean coal, at an elevation of 1275′ B. The **Luther Arnold Farm Mine (No. 17 on Map IV)**, located 1.8 miles west of Century, shows 5′ 6″ of clean coal, at an elevation of 1290′ B. The **D. Queen Farm Mine (No. 18 on Map IV)**, located 2.5 miles northwest of Century, measures 5′ 6″ of clean coal, at an elevation of 1320′ B.

Oda Gum Farm Mine—No. 18A on Map IV.

On Right Branch of Gnatty Creek, 1.5 miles southwest of Century; **Redstone Coal**; elevation, 1290′ B.

	Ft.	In.
Slate, roof....................................		
Coal, block....................................	4	10
Slate and fire clay, pavement..................		

A sample was collected from this opening the composition of which is published under **Mine No. 18A** in the table of coal analyses at the end of this Chapter.

The **Charles Reger Farm Mine (No. 19 on Map IV)**, located on Rock Run of Pecks Run, 1.5 miles southwest of Volga, shows, according to Teets, 4′ 10″ of block coal, at an elevation of 1615′ B.

The **L. A. Teter Farm Mine (No. 20 on Map IV)**, located on Little Pecks Run, 1.7 miles northeast of Pecks Run village, shows 5′ 4″ of clean coal, according to Teets, at an elevation of 1470′ B.

The **Dudley Marple Farm Mine (No. 21 on Map II)**, located on a branch of Pecks Run, 0.2 mile east of Pecks Run Station, shows 4′ 4″ of clean coal, at an elevation of 1615′ B., there being only a few acres of coal in the top of the knob. A sample was collected from this opening the composition of which is published under **Mine No. 21** in the table of coal analyses at the end of this Chapter. No Redstone Coal is found in the District east of this knob.

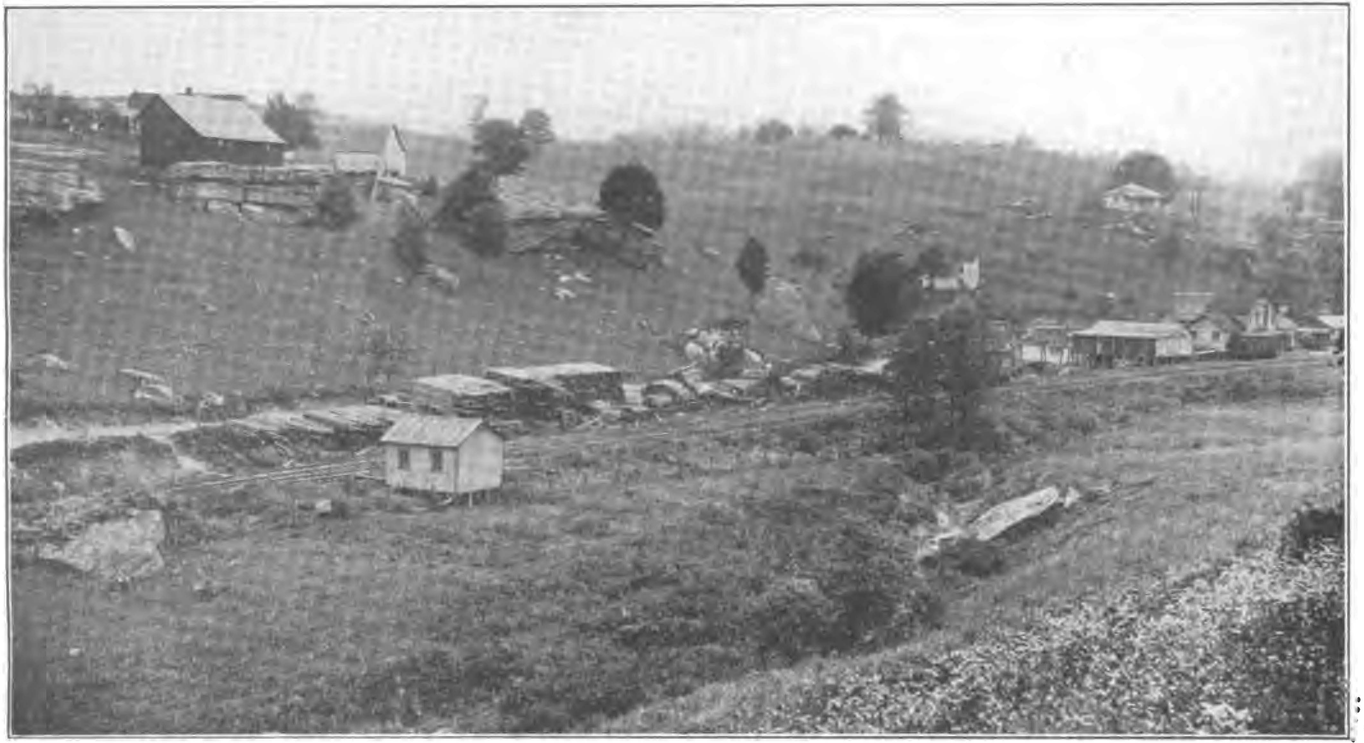

PLATE XXV.—Upper Freeport Sandstone cliff at Adrian, Upshur County; Topography of Conemaugh and Allegheny Series.

The **Thomas Stump Farm Mine (No. 22 on Map IV)**, located on a branch of Pecks Run, 0.8 mile northeast of Pecks Run village, shows 6′ 1″ of clean coal, according to Teets, at an elevation of 1430′ B.

At the village of Pecks Run, the coal is mined extensively for local use, the following information being obtained by Teets at the principal mine:

Opha Casto Farm Mine—No. 23 on Map IV.

On Pecks Run, at Pecks Run village; **Redstone Coal**; elevation, 1440′ B.

	Ft.	In.
Slate roof....................................		
Coal, block....................................	5	6
Slate floor....................................		

"Butts, N. 2° W.; 400 to 450 tons mined yearly."

A sample was collected from this opening the composition of which is published under **Mine No. 23** in the table of coal analyses at the end of this Chapter.

At **Coal Exposure No. 24 on Map IV**, on a branch of Pecks Run, 0.8 mile southwest of Pecks Run village, the coal is reported by Teets as being 4 to 5 feet thick in the public road, at an elevation of 1495′ B.

Along Hackers Creek, numerous openings have been made in the Redstone Coal, many of which are now abandoned and fallen shut because of the present use of natural gas for fuel. Enough of them are still in use, however, to show that the coal is of excellent thickness and character. The following structure was found by Teets on the extreme head of the creek:

Abram Bennett Farm Mine—No. 25 on Map IV.

On the head of Hackers Creek, 1.2 miles southwest of Pecks Run village; **Redstone Coal**; elevation, 1465′ B.

	Ft.	In.
Coal, block (with slate roof and pavement).....	5	11

"Butts, North and South."

A sample was collected the composition of which is published under **Mine No. 25** in the table of coal analyses at the end of this Chapter.

The **Charles Fitzgerald Farm Mine (No. 26 on Map IV)**, located 1.1 miles southeast of Ruraldale, shows 4′ 8″ of clean, block coal, according to Teets, at an elevation of 1410′ B. The **Wm. Warner Heirs Farm Mine (No. 27 on Map IV)**, located 0.7 mile southeast of Ruraldale, shows 5′ 3″ of clean, block coal, according to Teets, at an elevation of 1385′ B. The **Jesse Regester Farm Mine (No. 28 on Map IV)**, located on a branch 0.4 mile northeast of Ruraldale, measures 5′ 3″ of clean, block coal, according to Teets, at an elevation of 1360′ B. The **Alva Karickhoff Farm Mine (No. 29 on Map IV)**, located on the same branch, 0.9 mile northeast of Ruraldale, shows 5′ 9″ of clean, block coal, according to Teets, at an elevation of 1360′ B. The following opening, examined by Teets, is located along the axis of the Ruraldale Anticline:

Manley Post Farm Mine—No. 30 on Map IV.

On Big Run of Hackers Creek, 1 mile northwest of Ruraldale: Redstone Coal; elevation, 1370′ B.

	Ft.	In.
Slate roof....................................		
Coal, block....................................	5	11
Fire clay and slate, pavement..................		

A sample was collected, the composition of which is published under **Mine No. 30** in the table of coal analyses at the end of this Chapter.

The **Benjamin Wilson Farm Mine (No. 31 on Map IV)**, located on Big Run, 1.3 miles northwest of Ruraldale, shows 5′ 9″ of clean, block coal, according to Teets, the elevation being 1360′ B. The **T. J. Post Farm Mine (No. 32 on Map IV)**, located on Left-Hand Fork, 1.3 miles northwest of Ruraldale, was partly filled with mud and water when examined but showed 4′ 0″ of clean coal, at an elevation of 1340′ B. The **Guy Post Farm Mine (No. 33 on Map IV)**, on Left-Hand Fork, 1.9 miles northwest of Ruraldale, shows 4′ 10″ of clean coal, at an elevation of 1255′ B. The **Columbus McPherson Farm Mine (No. 34 on Map IV)**, located on the Left-Hand Fork, 2.3 miles south of Johnstown, shows 6′ 0″ of clean coal, at an elevation of 1260′ B. The following mine is near the Harrison County Line:

Arden Norman Farm Mine—No. 35 on Map IV.

On Left-Hand Fork of Hackers Creek, 1.7 miles southeast of Johnstown; **Redstone Coal**; elevation, 1290′ B.

	Ft.	In.
Coal (with slate roof and pavement)	6	3

A sample was collected from this opening, the composition of which is published under **Mine No. 35** in the table of coal analyses at the end of this Chapter.

The following mine is located along the main creek:

Claudius Marple Farm Mine—No. 36 on Map IV.

On Hackers Creek, 1.8 miles southwest of Ruraldale; **Redstone Coal**; elevation, 1325′ B.

	Ft.	In.
Sandstone, massive, **Cedarville**		
Shale, sandy	10	0
Coal	4	0
Slate, pavement		

A sample was collected from this opening, the composition of which is published under **Mine No. 36** in the table of coal analyses at the end of this Chapter.

The **Isaac S. Reger Farm Mine (No. 37 on Map IV)**, located along the main creek, 1.9 miles west of Ruraldale, is now fallen shut but when the coal was formerly mined there it showed a thickness of 4 to 5 feet, the elevation being 1285′ B. The **A. L. Marple Farm Mine (No. 38 on Map IV)**, on a short branch, 2.6 miles southwest of Ruraldale and 0.6 mile eastward from Bear Knob, exhibited 4′ 2″ of clean coal, at an elevation of 1275′ B. The **Ira Hess Farm Mine (No. 39 on Map IV)**, on the main creek, 1.6 miles northeast of Aberdeen, shows 4′ 3″ of clean coal, at an elevation of 1220′ B. The following mine is near the axis of the Grassland Syncline:

S. E. Marple Farm Mine—No. 40 on Map IV.

On Hackers Creek, 1.5 miles northeast of Aberdeen; **Redstone Coal**; elevation, 1215′ B.; butts, N. 85° W.

	Ft.	In.
Shale, sandy		
Coal (with slate pavement)	4	6

A sample was collected from this opening, the composition of which is published under **Mine No. 40** in the table of coal analyses at the end of this Chapter.

The **John Jamison Farm Mine (No. 41 on Map IV),** located on Rover Run, 1.3 miles southeast of Aberdeen, was partly filled with water when visited but showed 4′ 0″ of coal, some clay seams being visible, and the elevation of the coal being 1235′ B. The **Lloyd Lewis Farm Mine (No. 42 on Map IV),** on Rover Run, 1.5 miles southeast of Aberdeen, exhibits 4′ 9″ of clean coal, at an elevation of 1240′ B.

The Redstone Coal was formerly mined extensively for local use in the extreme northwestern corner of the District next to the Lewis and Harrison Lines on the headwaters of Rooting Creek and Jesse Run, but several of these openings have fallen shut because of the present use of natural gas in the neighborhood. The **Allen Queen Farm Mine (No. 43 on Map IV),** located on Rooting Creek, 3 miles south of Johnstown, exhibits 5′ 7″ of clean coal, at an elevation of 1265′ B. The **James and Simon Davis Farm Mine (No. 44 on Map IV),** located on a branch of Rooting Creek, 1.9 miles south of Johnstown, shows 4′ 3″ of clean coal at an elevation of 1245′ B., there being 5 inches of cannel bone immediately over the coal.

There is a fine body of Redstone Coal along Turkey Run, where the high topographic level of the stream brings the coal much nearer drainage than on Hackers Creek to the north. At the **Lloyd Reeder Farm Mine (No. 45 on Map IV),** located near the head of the run, 1.8 miles southwest of Ruraldale, the coal was formerly mined by stripping in the bed of the run, having a thickness of about 4 feet, and an elevation of 1445′ B. The **Albro Teets Farm Mine (No. 46 on Map IV),** located on a short branch of the run, 1.6 miles southwest of Ruraldale, was fallen shut when visited, but was reported to be about 4 feet thick, its elevation being 1455′ B. The following is a prominent opening along the main run:

Houston Radabaugh Farm Mine—No. 47 on Map IV.

On Turkey Run, 2.1 miles southwest of Ruraldale; Redstone Coal; elevation, 1465′ B.

	Ft.	In.
Shale, sandy		
Coal	4	6
Slate, pavement		

A sample was collected at this opening, the composition of which is published under **Mine No. 47** in the table of coal analyses at the end of this Chapter.

The **Charles Daugherty Farm Mine (No. 48 on Map IV)**, on Coon Fork, 2.5 miles southwest of Ruraldale, showed 4′ 0″ of clean coal, at an elevation of 1475′ B. The **Lloyd Reeder Farm Mine (No. 49 on Map IV)**, on a short branch, 1.8 miles south of Ruraldale, measures 4′ 3″ of clean coal, according to Teets, the elevation being 1480′ B. The **Gilmore Brake Farm Mine (No. 50 on Map IV)**, on a short branch, 2.8 miles northwest of Buckhannon, showed 4′ 3″ of clean coal, according to Teets, the elevation being 1520′ B. The **John Teets Farm Mine (No. 51 on Map IV)**, on Sugar Run, 1.5 miles southwest of Pecks Run village, exhibits 5′ 0″ of clean coal, according to Teets, its elevation being 1465′ B. The **J. E. Green Heirs Farm Mine (No. 52 on Map IV)**, on the right branch of Sugar Run, 1.9 miles southwest of Pecks Run village, shows 5′ 6″ of clean coal, according to Teets, at an elevation of 1515′ B. The **J. M. Shumaker Farm Mine (No. 53 on Map IV)**, on the right branch of Sugar Run, 1.8 miles southwest of Pecks Run village, measured 5′ 1″ of clean, blocky coal, according to Teets, at an elevation of 1525′ B. A large amount of coal from this mine was formerly hauled to Buckhannon for domestic fuel before natural gas was brought to that city. The **Perry Westfall Farm Mine (No. 54 on Map IV)**, on the right branch of Sugar Run, 1.5 miles southwest of Pecks Run, shows 5′ 6″ of clean, block coal, according to Teets, at an elevation of 1530′ B. The following section was measured by Teets in an opening along the main run:

William Post Farm Mine—No. 55 on Map IV.

On Turkey Run, 2.5 miles southwest of Pecks Run village; Redstone Coal; elevation, 1540' B.

			Ft.	In.
Coal, rotten	1'	2"		
Coal, slaty	0	3		
Coal, block	5	0	6	5

The **William Lance Farm Mine (No. 56 on Map IV),** on Three Lick Run, 2.3 miles northwest of Buckhannon, measures 4' 1", according to Teets, the elevation being 1570' B. The **Lashley and Nelson Debarr Farm Mine (No. 57 on Map IV),** on Three Lick Run, 1.8 miles northwest of Buckhannon, shows 4' 0" of clean, block coal, according to Teets, at an elevation of 1600' B. The **David Teets Farm Mine (No. 58 on Map IV),** located on Three Lick Run, 1.8 miles north of Buckhannon, had partly fallen shut when it was examined by Teets, but 3' 9" of clean coal was still visible, the elevation being 1615' B. The following is another mine in the same vicinity:

Luther Martin Farm Mine—No. 59 on Map IV.

On a branch of Three Lick Run, 1.9 miles north of Buckhannon; Redstone Coal; elevation, 1630' B.

	Ft.	In.
Coal (with slate roof and floor)	4	8

A sample was collected by Teets at this mine, the composition of which is published under **Mine No. 59** in the table of coal analyses at the end of this Chapter. The coal in this locality lies near the tops of the hills and a large part of it has already been mined and hauled on wagons to Buckhannon for steam and domestic fuel, where it has always been held in high favor by the consumers.

Redstone Coal, Buckhannon District, Upshur.

In Buckhannon District, there is a large acreage of the Redstone Coal in the northwestern corner in the vicinity of Lorentz, but the coal rises rapidly southeastward until it disappears above the hilltops west of Buckhannon. The coal has been mined commercially at two points in the District. Numerous openings have been made along the waters of Fink Run, where the coal is uniformly good. The following is a farm mine from which a large amount of coal has been wagoned into Buckhannon for steam and domestic use, as reported by Teets:

Alberta Post Farm Mine—No. 60 on Map IV.

On the northern branch of Fink Run, 1.2 miles north of Buckhannon; Redstone Coal; elevation, 1660' B.

	Ft.	In.
Coal, good, block (with slate roof and pavement)	5	1

A sample was collected from this opening, the composition of which is published under **Mine No. 60** in the table of coal analyses at the end of this Chapter.

At the **G. M. Fleming Farm Mine (No. 61 on Map IV)**, on the same branch of Fink Run, 1.6 miles northwest of Buckhannon, the coal is reported clean and blocky, and 4' 1" thick, at an elevation of 1655' B. The **G. M. Fleming Farm Mine (No. 62 on Map IV)**, located on Mudlick Run, 1.7 miles northwest of Buckhannon, measures 3' 10" of clean coal, at an elevation of 1650' B., being near the top of the ridge. A sample was collected from this opening, the composition of which is published under **Mine No. 62** in the table of coal analyses at the end of this Chapter.

At the **D. B. Rohrbough Farm Mine (No. 63 on Map IV)**, on Mudlick Run, 2.7 miles northeast of Lorentz, the opening was partly filled with water but showed 4' 0" of clean coal, at an elevation of 1525' B. The **Ira Strader Farm Mine (No. 64 on Map IV)**, on Mudlick Run, 2.8 miles northeast of Lorentz, measures 4' 0" of clean coal, at an elevation of 1525' B. The **A. B. Bailey Farm Mine (No. 65 on Map IV)**, on Mudlick Run, 2 miles northeast of Lorentz, shows 5' 0" of clean coal, at an elevation of 1465' B. At the **Philip Smith Heirs Coal Exposure (No. 66 on Map IV)**, on the head of Mudlick Run, 2.3 miles northeast of Lorentz, the coal measures 4' 6", being just above drainage, at an elevation of 1425' B.

At the following mine the coal has been operated commercially for several years, being of good quality except that clay veins occasionally appear in the seam, causing considerable trouble. The information as given below was secured by Ray V. Hennen and formerly published in Volume II(A), page 672, of the Survey:

Red Rock Fuel Company Mine—No. 67 on Map IV.

On Wash Run of Fink, 0.8 mile north of Red Rock Station; Redstone Coal; elevation, 1490′ B.

		Ft.	In.
1.	Sandstone, massive, slate at bottom.........	100	0
2.	Coal, Redstone, bright, hard, 3′ 0″ to........	4	2½
3.	Slate and concealed........................	45	0
4.	Coal, Pittsburgh, heavy blossom, said to be..	1	6
5.	Slate		

"Butts, N. 75° W.; faces, S. 15° W.; greatest rise, S. 51½° E., 1.8 per cent.; mine capacity, 250 tons; men employed, 45; coal shipped East for steam purposes; authority for mine data, Robert Long, Superintendent; sample from No. 2 for analysis."

The composition of this sample is published under **Mine No. 67** in the table of coal analyses at the end of this Chapter. According to Mr. H. L. Reppert, the present Superintendent, most of the coal now goes West to Detroit and the capacity of the mine is somewhat increased over the figures shown above.

Two mines have been recently opened for commercial shipment on the property of A. J. Marple, both having been located since field work was completed. The **Midway Mine** of the **Graham-Sharfeneker Coal Company (No. 67A on Map IV)**, of Buckhannon, West Virginia, is located on Fink Run, 0.9 mile east of Lorentz, where the coal has an elevation of 1448′ L. The **Sarah Mine** of the **Florence Coal Mining Company (No. 67B on Map IV)**, of Latrobe, Pennsylvania, is located on Fink Run, 0.7 mile east of Lorentz, the coal being only a few feet lower than at the Midway Mine.

The coal has been mined by slope at the following opening where it is slightly under drainage. At the time of the writer's visit to this locality, the mine was not in operation and the entrance was closed, the data as published below having been obtained by Ray V. Hennen and previously published in Volume II(A), page 672, of the Survey. The mine has lately been reopened and is now shipping coal:

Pennsylvania Consolidated Coal Co. Mine—No. 68 on Map IV.

On Fink Run, 0.3 mile east of Lorentz; Redstone Coal; elevation, 1430′ B.

	Ft.	In.
1. Slate		
2. Coal, Redstone, bright, hard, 3 feet to	4	4
3. Slate		

"Butts, S. 75° E.; faces, S. 15° W.; greatest rise, S. 50° E.; mine capacity, 100 tons; authority for mine data, C. C. Duvall, Pumper and Engineer; sample from No. 2 for analysis."

The composition of the above sample is published under **Mine No. 68** in the table of coal analyses at the end of this Chapter. According to recent information, the above mine is being operated by the **Pool-Townsend Coal Company.**

The **A. J. Marple Farm Mine (No. 69 on Map IV)**, located on Bills Run, 1.1 miles southeast of Lorentz, was partly filled with water when examined, but showed 3 to 4 feet of clean coal, at an elevation of 1460′ B. The **Ed Hinzman Farm Mine (No. 70 on Map IV)**, located on Brushy Fork, 1.3 miles southeast of Lorentz, shows 3′ 8″ of clean coal, at an elevation of 1500′ B. The following is another opening farther east:

J. E. Green Heirs Farm Mine—No. 71 on Map IV.

On Brushy Fork of Fink; 1.5 miles north of Atlas; Redstone Coal; elevation, 1585′ B.

			Ft.	In.
Shale, sandy				
Coal	2′	7″		
Shale, gray	0	6		
Coal	0	10	3	11
Slate pavement				

A few openings have been made on the waters of Stonecoal Creek, some of them being along Spruce Fork where they are near drainage on account of the high plateau, while others are farther down where the Stonecoal waters have cut nearly 400 feet deeper in the measures, making the coal high in the hills. The **L. L. Dowell Farm Mine (No. 72 on Map IV)**, located on Spruce Fork, 1.3 miles west of Atlas, shows 3′ 10″ of clean coal, at an elevation of 1560′ L. The **Fred Cleavenger Farm Mine (No. 73 on Map IV)**, on Spruce Fork, 1.6 miles northwest of Atlas, measures 3′ 0″ of clean coal, having an elevation of 1485′ B. The **Lee Lewis Heirs Farm Mine (No. 74 on Map IV)**, on Spruce Fork, 1.8 miles west of Atlas, shows 3′ 6″ of clean coal, at an elevation of 1500′ B. The **Thomas Moss Farm Mine (No. 75 on Map IV)**, on Right Fork of Stonecoal, 2.2 miles west of Atlas, measures 2′ 9″ of clean coal, at an elevation of 1490′ B.

Quantity of Redstone Coal Available.

The following table shows the probable amount of Redstone Coal available in those Districts of both counties where it is found, computed on the basis of 25 cubic feet of coal per short ton, the area being measured with planimeter by Teets from the outcrops shown on Maps II and IV:

Probable Amount of Redstone Coal.

Counties by Districts.	Thickness of Bed Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Barbour:					
Pleasant	3	8.70	5,568	727,626,240	29,105,050
Elk	3	8.00	5,120	669,081,600	26,763,264
Union	5	8.80	5,632	1,126,649,600	45,065,984
Philippi	4	0.15	96	16,727,040	669,081
Totals		25.65	16,416	2,540,084,480	101,603.379
Upshur:					
Warren	5	21.95	14,048	3,059,654,400	122,386,176
Buckhannon	4	9.35	5,984	1,042,652,160	41,706,086
Totals		31.30	20,032	4,102,306,560	164,092.262
Totals for Both Counties.......		56.95	36,448	6,642,391,040	265,695,641

PITTSBURGH COAL.

The Pittsburgh Coal, previously discussed in Chapter V, page 200, and shown by outcrop lines on Maps II and IV in those regions where it occurs in minable thickness above drainage, is a valuable fuel resource in western Barbour and northern Upshur, being mined commercially on a large scale at one point and being tested and held for reserve fuel at another large mine. In western Barbour it has been opened at many points for local domestic use, and varies from 5 to 10 feet thick, being practically free from slates and other impurities. In Upshur it is thick enough for mining only in the northeastern corner, where it has been used but little owing to the superior Redstone Coal which everywhere in that locality is found above it. The chemical composition of the Pittsburgh Coal shows it to be a fine coal for steam and domestic fuel, but its sulphur content is usually too high to permit its use for coke. In this Report it has been used as the basis for the structure map in western Barbour and northern Upshur. Its probable minable extent is shown by Figure 5.

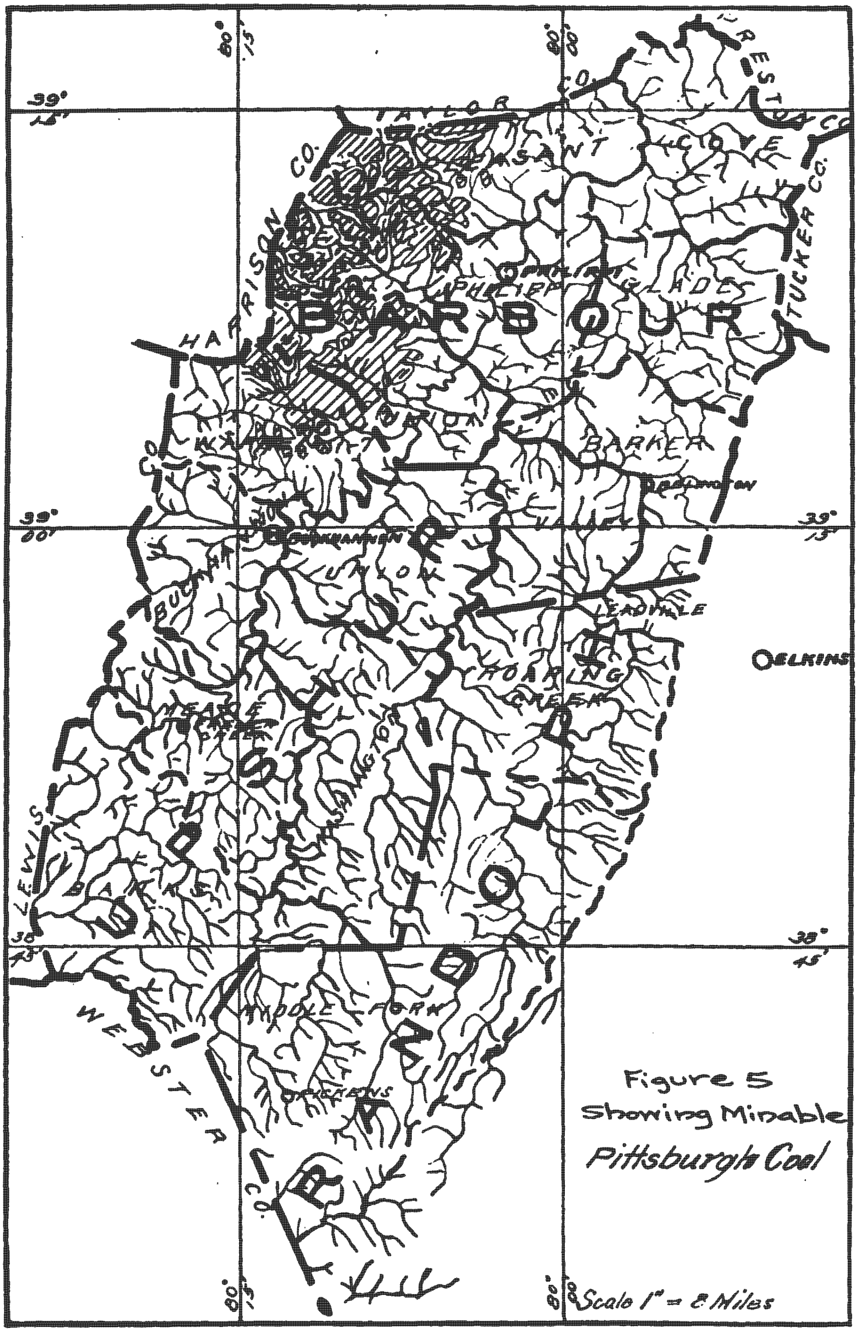

Figure 5
Showing Minable
Pittsburgh Coal

Pittsburgh Coal, Pleasant District, Barbour.

In Pleasant District, the Pittsburgh Coal is above drainage along the principal streams but the eastward rise of the rocks carries its horizon above the hilltops in the eastern third of the District. One large mine operates it commercially and others are being projected. Several farm openings have been made along Pleasant Creek, which are reported by Teets as follows:

The **John Lough Farm Mine (No. 76 on Map II)**, located 2.9 miles west of Pleasant Creek village, showed 7′ 1″ of clean coal, at an elevation of 1440′ B. The **Columbus Lough Farm Mine (No. 77 on Map II)**, located 3.1 miles west of Pleasant Creek village, showed 7′ 0″ of clean coal, the elevation being 1390′ B. The **Benjamin Bartlett Farm Mine (No. 78 on Map II)**, located 2.5 miles north of Berryburg, measured 6′ 1″ of clean coal, at an elevation of 1360′ B. The following mine was sampled for analysis:

C. J. Stansberry Farm Mine—No. 79 on Map II.

On Pleasant Creek, 2.5 miles northwest of Berryburg; Pittsburgh Coal; elevation, 1300′ B.

	Ft.	In.
Coal (with slate roof and pavement)...........	7	6

A sample was collected from this coal, the composition of which is published under **Mine No. 79** in the table of coal analyses at the end of this Chapter.

The **Joshua Cole Farm Mine (No. 80 on Map II)**, located 2.2 miles north of Berryburg, showed 6′ 2″ of clean coal, at an elevation of 1345′ B. The **C. J. Stansberry Farm Mine (No. 81 on Map II)**, located on a branch 2 miles northeast of Berryburg, measured 8′ 2″ of coal, with an elevation of 1435′ B. The **Owen Haddix Farm Mine (No. 82 on Map II)**, located on a branch 2 miles southwest of Pleasant Creek village, showed 5′ 1″ of coal at an elevation of 1665′ B., being near the top of the hill and having only about 10 feet of cover over the coal.

A small acreage of the coal is found on the head of Taylor Drain of Tygart Valley River where the following mines are reported by Teets:

The **Harter Wilson Farm Mine (No. 83 on Map II)**, located 0.9 mile north of Switzer, measured 6′ 0″ of clean coal, at an elevation of 1675′ B. The **Abraham McDaniels Farm Mine (No. 84 on Map II)**, located 1.1 miles north of Switzer, showed 6′ 2″ of clean coal, with an elevation of 1670′ B.

On Foxgrape Run of Hackers Creek, the coal is being mined not only for farm use but also for commercial fuel as well, the following openings being reported by Teets:

The **Calvin Boylen Farm Mine (No. 85 on Map II)**, located 1.5 miles northeast of Berryburg, showed 5′ 3″ of coal, at an elevation of 1605′ B., part of the coal being concealed. A sample was collected from this opening, the composition of which is published under **Mine No. 85** in the table of coal analyses at the end of this Chapter.

The **Isaac Duckworth Farm Mine (No. 86 on Map II)**, located 0.4 mile east of Berryburg, measured 7′ 9″ of coal, at an elevation of 1530′ B. The following is another opening near Berryburg:

W. W. Heatherly Farm Mine—No. 87 on Map II.

On Foxgrape Run, 0.6 mile south of Berryburg; **Pittsburgh Coal**; elevation, 1510′ B.

			Ft.	In.
Slate				
Coal	4′	2″		
Coal, harder	0	6		
Coal	4	5	9	1

The coal is being mined extensively by the Consolidation Coal Company, successors to the Southern Coal and Transportation Company, on the head of Foxgrape Run, where the seam lies only a few feet above drainage, at an ideal height for mining. These mines were examined by A. P. Brady, as previously reported in Volume II, pages 180-181, of the Survey. The coal is mined on both sides of the creek, as the following report by Teets will show:

Consolidation Coal Co. No. 37 Mine (Berryburg)—No. 88 on Map II.

On south side of Foxgrape Run, at Berryburg; **Pittsburgh Coal**; elevation, 1438' L.

			Ft.	In.
1. **Coal**, head	1'	6"		
2. **Coal**	7	1	8	7
3. Slate				

"Owned by Consolidation Coal Company; principal office. Fairmont, West Virginia; daily capacity, 1600 tons; daily output, 600 tons; 43 laborers and 60 miners employed; electric haulage; shipped East for steam fuel; butts, N. 83° E.; faces, N. 7° W.; greatest rise, southeast; sample collected from No. 2 of section in 4th Right Heading off No. 1 South, by D. D. Teets, Jr.; W. W. Ferguson, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 88** in the table of coal analyses at the end of this Chapter.

Consolidation Coal Co. No. 37 Mine (Berryburg)—No. 89 on Map II.

On the north side of Foxgrape Run, at Berryburg; **Pittsburgh Coal**; elevation, 1410' B.

			Ft.	In.
Slate roof				
Coal	4'	8"		
Coal, harder	0	5		
Coal	4	4	9	5

"Owned by Consolidation Coal Company; principal office, Fairmont, West Virginia; daily capacity, 1500 tons; daily output, 1000 tons; 125 miners and 75 laborers employed; electric haulage; shipped East for steam fuel; W. W. Ferguson, Superintendent, authority for mine data."

According to Teets, only 7' 6" of the coal is mined, 18 to 20 inches being left up for roof. The composition of a sample from this mine, as previously collected by Mr. Brady, is published under **Mine No. 89** in the table of coal analyses at the end of this Chapter.

Numerous farm openings have been made along Simpson Creek, reported as follows by Teets:

The **Floyd Talbott Farm Mine (No. 90 on Map II)**, located 0.9 mile north of Berryburg, at an elevation of 1415' B., had fallen shut and no measurement was obtained. The **Sylvanus Talbott Farm Mine (No. 91 on Map II),** located 1.1 miles northwest of Berryburg, measured 7′ 5″, at an elevation of 1345′ B. The **O. F. Marks Farm Mine (No. 92 on Map II),** located 1.3 miles northwest of Berryburg, showed 7′ 6″ of clean coal, at an elevation of 1330′ B. The **Lon Clevenger Farm Mine (No. 93 on Map II),** located 2.5 miles northwest of Berryburg, measured 8′ 3″ in all, there being 9″ of harder coal about 4 feet from the top, the elevation of the mine being 1250′ B. Another opening shows the following:

A. I. Clevenger Farm Mine—No. 94 on Map II.

On Simpson Creek, 2.1 miles northwest of Berryburg; Pittsburgh Coal; elevation, 1275′ B.

			Ft.	In.
Slate				
Coal	2′	7″		
Coal, hard	0	8		
Coal	4	0	7	8
Slate, pavement				

Hezekiah Shaw Farm Mine—No. 95 on Map II.

On Simpson Creek, 1.6 miles southeast of Astor; Pittsburgh Coal; elevation, 1240′ B.

			Ft.	In.
Slate				
Coal	2′	10″		
Coal, hard	0	8		
Coal	4	0	7	6
Slate, pavement				

The **J. K. Clevenger Farm Mine (No. 96 on Map II),** located 1.1 miles southeast of Astor, measured 7′ 6″ of clean coal, at an elevation of 1215′ B. The **C. G. Clevenger Farm Mine (No. 97 on Map II),** located 0.8 mile southeast of Astor, showed 7′ 7″ of clean coal, at an elevation of 1210′ B. The **Ed Tomblyn Farm Mine (No. 98 on Map II),** located 0.6 mile west of Astor, measured 7′ 0″ of clean coal, with an elevation of 1250′ B. The **W. B. Crouse Farm Mine (No. 99 on Map II),** located 0.6 mile southwest of Astor, showed 6′ 11″ of clean coal, at an elevation of 1265′ B. The **W. E. Stuart Farm Mine**

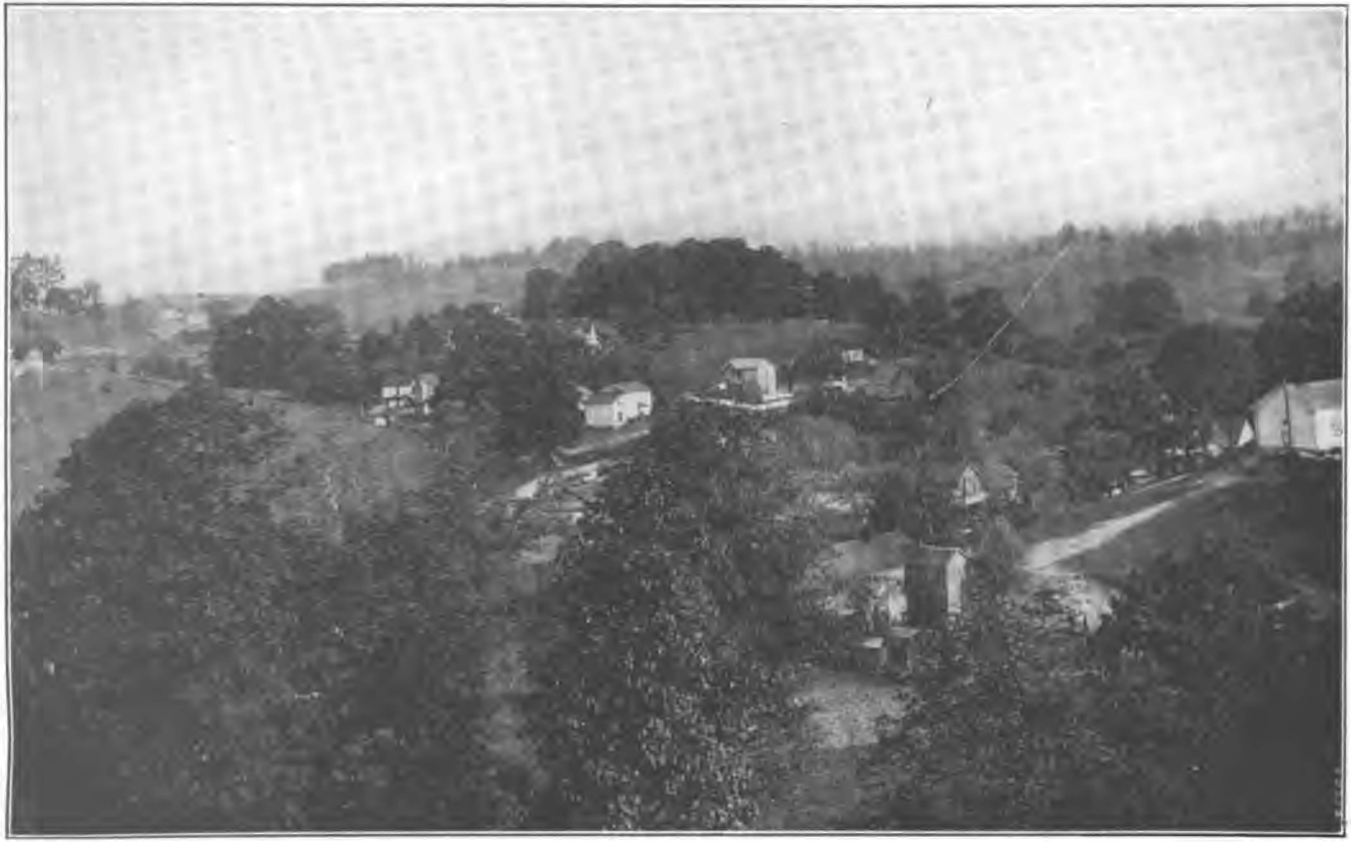

PLATE XXVI.—View at French Creek, Upshur County, looking north, and showing characteristic topography of the Allegheny Series.

(No. 100 on Map II), located on Bartlett Run, 1.2 miles west of Astor, measured 6′ 10″ of clean coal, at an elevation of 1270′ B. The **Consolidation Coal Company Farm Mine (No. 101 on Map II)**, located on Bartlett Run, 1.2 miles southwest of Astor, showed 7′ 1″ of clean coal, at an elevation of 1270′ B. The **Webster Goodwin Heirs Farm Mine (No. 102 on Map II)**, located on the east fork of West Branch, 1.6 miles southeast of Astor, measured 7′ 3″ of clean coal, at an elevation of 1230′ B. The **Cleophas Goodwin Farm Mine (No. 103 on Map II)**, located on Stillhouse Branch, 1.8 miles south of Astor, showed 7′ 1″ of clean coal, at an elevation of 1240′ B. The **O. D. Queen Farm Mine (No. 104 on Map II)**, located on West Branch, 2.2 miles south of Astor, measured 7′ 4″ of clean coal, at an elevation of 1270′ B. The **Samuel Rice Farm Mine (No. 105 on Map II)**, located on West Branch, 2.6 miles south of Astor, showed 7′ 3″ of clean coal, at an elevation of 1290′ B. The **D. G. Wright Farm Mine (No. 106 on Map II)**, located on West Branch, 2.8 miles south of Astor, showed 7′ 1″ of clean coal, at an elevation of 1295′ B. The **Rebecca Bartlett Farm Mine (No. 107 on Map II)**, located on West Branch, 2.3 miles southwest of Astor, measured 7′ 3″ of clean coal, at an elevation of 1315′ B., the entire thickness of the coal not being exposed as the upper portion was left up for roof.

Pittsburgh Coal, Elk District, Barbour.

In Elk District, the Pittsburgh Coal covers a considerable acreage, being found well up in the hills in the western and central parts. In the southeastern end, however, in the vicinity of Elk City, the rise of the rocks has elevated the horizon of this coal above the tops of the hills. In those regions where the coal is found it is of good quality and thickness, as the following openings, examined by Teets, will show:

Several openings have been made along Brushy Fork of Elk. The **E. L. Smith Farm Mine (No. 108 on Map II)**, located 1.8 miles west of Pepper, showed 6′ 3″ of clean coal, at an elevation of 1340′ B. The **William Reeder Farm Mine (No. 109 on Map II)**, located 0.8 mile west of Pepper, measured 8′ 2″ of clean coal, at an elevation of 1325′ B. The **Vy Hudkins**

Farm Mine (No. 110 on Map II), located 0.6 mile southeast of Pepper, showed 7′ 9″ of clean coal, with an elevation of 1295′ B. The **Emma Hudkins Farm Mine (No. 111 on Map II)**, located 1 mile southeast of Pepper, showed 8′ 0″ of clean coal, at an elevation of 1295′ B. The following measurement was made in the same locality:

Winford Knight Farm Mine—No. 112 on Map II.

On Brushy Fork of Elk, 1.1 miles northeast of Pepper; **Pittsburgh Coal**; elevation, 1295′ B.

	Ft.	In.
Limestone, **Redstone**	4	6
Sandstone and concealed	15	0
Slate	2	0
Coal, Pittsburgh	8	1
Slate, pavement		

On main Elk and its several short branches, there are numerous openings of the coal. The **J. H. Bird Farm Mine (No. 113 on Map II)**, located on Bird Run, 1.1 miles northwest of Overfield, showed 6′ 4″ of clean coal, at an elevation of 1250′ B. The **John Paugh Farm Mine (No. 114 on Map II)**, located on Arnold Run, 0.9 mile southwest of Overfield, showed 6′ 10″ of clean coal, at an elevation of 1280′ B. The **Draper Paugh Heirs Farm Mine (No. 115 on Map II)**, located on a branch of Arnold Run, 0.6 mile south of Overfield, measured 7′ 1″ of clean coal, at an elevation of 1305′ B. The **Ed. Young Farm Mine (No. 116 on Map II)**, located on a branch of Arnold Run, 0.8 mile southeast of Overfield, showed 7′ 0″ of clean coal, at an elevation of 1315′ B. The **Ed. Young Farm Mine (No. 117 on Map II)**, located on Arnold Run, 1.6 miles northwest of Peeltree, measured 6′ 9″ of clean coal, at an elevation of 1285′ B. The **Isaac Paugh Farm Mine (No. 118 on Map II)**, located on Arnold Run, 1.4 miles northeast of Peeltree, showed 5′ 9″ of clean coal, at an elevation of 1265′ B. The **Oran Martin Farm Mine (No. 119 on Map II)**, located on Arnold Run, 2 miles northeast of Peeltree, measured 5′ 11″ of clean coal, at an elevation of 1240′ B. The **Nathan Johnson Farm Mine (No. 120 on Map II)**, located on main Elk, 0.3 mile north of Overfield, showed 6′ 1″ of clean coal, at an elevation of 1305′ B.

Franklin Paugh Farm Mine—No. 121 on Map II.

On a branch of Elk, 1.4 miles northeast of Overfield; **Pittsburgh Coal**; elevation, 1320′ B.

		Ft.	In.
Slate			
Coal	4′ 0″		
Coal, hard	0 8		
Coal	3 11	8	7
Slate, pavement			

Creed Watson Farm Mine—No. 122 on Map II.

On a branch of Elk, 1.9 miles northeast of Overfield; **Pittsburgh Coal**; elevation, 1300′ B.

		Ft.	In.
Slate			
Coal	4′ 2″		
Coal, hard	0 10		
Coal	3 10	8	10
Slate, pavement			

The **J. J. House Farm Mine (No. 123 on Map II)**, located on a branch of Elk, 1.9 miles northeast of Overfield, showed 8′ 9″ of clean coal, at an elevation of 1335′ B.

John Stone Farm Mine—No. 124 on Map II.

On a branch of Elk, 2.1 miles northeast of Overfield; **Pittsburgh Coal**; elevation, 1330′ B.

		Ft.	In.
Slate			
Coal	4′ 3″		
Coal, harder	0 10		
Coal	3 10	8	11
Slate, pavement			

The **D. G. Hudkins Farm Mine (No. 125 on Map II)**, located 2.3 miles east of Overfield, showed 8′ 0″ of coal, at an elevation of 1265′ B., coming 35 feet below the Redstone Coal.

The **Creed Nutter Farm Mine (No. 126 on Map II)**, located on a branch, 2.8 miles east of Overfield, showed 8′ 6″ of clean coal, at an elevation of 1295′ B.

A. G. Humphreys Farm Mine—No. 127 on Map II.

On Isaacs Run of Elk, 3 miles northwest of Elk City; **Pittsburgh Coal**; elevation, 1265′ B.

			Ft.	In.
Slate				
Coal	4′	0″		
Coal, hard	0	8		
Coal	3	3	7	11
Slate, pavement				

M. D. Riley Farm Mine—No. 128 on Map II.

On Isaacs Run of Elk, 3.4 miles northwest of Elk City; **Pittsburgh Coal**; elevation, 1290′ B.

			Ft.	In.
Slate				
Coal	3′	8″		
Coal, hard	0	9		
Coal	3	8	8	1
Slate, pavement				

William Stout Farm Mine—No. 129 on Map II.

On Isaacs Run of Elk, 2 miles southeast of Overfield; **Pittsburgh Coal**; elevation, 1255′ B.

			Ft.	In.
Slate				
Coal	3′	10″		
Coal, hard	0	9		
Coal	3	7	8	2
Slate, pavement				

The **Ledrew Paugh Farm Mine (No. 130 on Map II)**, located on Isaacs Run, 1.8 miles southeast of Overfield, showed 8′ 0″ of clean coal, at an elevation of 1240′ B.

J. L. Dickinson Farm Mine—No. 131 on Map II.

On Beech Lick Run of Elk, 2.5 miles northwest of Elk City; **Pittsburgh Coal**; elevation, 1305′ B.

			Ft.	In.
Slate, black			1	6
Coal, soft	1′	1″		
Coal, bony	0	3		
Coal, blocky	5	3	6	7
Slate, pavement				

J. N. Cutlip Farm Mine—No. 132 on Map II.

On Beech Lick Run of Elk, 2.2 miles west of Elk City, **Pittsburgh Coal**; elevation, 1335′ B.

			Ft.	In.
Shale, gray				
Coal	0′	6″		
Coal, bony	0	2		
Coal	5	0	5	8
Slate, pavement				

Several openings have been made along the two branches of Stewart Run of Elk, as follows:

S. J. Gall Farm Mine—No. 133 on Map II.

On a branch of Stewart Run of Elk, 1.6 miles northwest of Elk City; **Pittsburgh Coal**; elevation, 1420′ B.

			Ft.	In.
Shale				
Coal	0′	8″		
Coal and bone	3	0		
Coal, mined	6	1	9	9
Slate, pavement				

Amos Nutter Farm Mine—No. 134 on Map II.

On Stewart Run of Elk, 2.5 miles northwest of Elk City; **Pittsburgh Coal**; elevation, 1325′ B.

	Ft.	In.
Coal (with slate roof and pavement)	8	11

A sample was collected at this opening, the composition of which is published under **Mine No. 134** in the table of coal analyses at the end of this Chapter.

The **Ed. Watson Farm Mine (No. 135 on Map II)**; located on Stewart Run of Elk, 2.6 miles northwest of Elk City, measured 8′ 10″ of clean coal, at an elevation of 1325′ B. The **Adam Dearing Farm Mine (No. 136 on Map II)**, located 2.6 miles southwest of Berryburg, measured 8′ 3″ of clean coal, at an elevation of 1325′ B. The **Granville Clevenger Farm Mine (No. 137 on Map II)**, located 2.2 miles southwest of Berryburg, showed 8′ 3″ of clean coal, with an elevation of 1320′ B. The **Emma Hudkins Farm Mine (No. 138 on Map II)**, located 2 miles southwest of Berryburg, at an elevation of 1345′ B., had fallen shut and the thickness was not obtained. The **J. G. Carlin Farm Mine (No. 139 on Map II)**, located 1.6 miles southwest of Berryburg, measured a total of 9′ 0″ of coal, 6′ 0″ of it being mined, at an elevation of 1360′ B.

W. D. and T. G. McKinney Farm Mine—No. 140 on Map II.

On Stewart Run, 1.5 miles west of Berryburg; Pittsburgh Coal; elevation, 1340′ B.

			Ft.	In.
Slate				
Coal	4′	0″		
Coal, harder	0	6		
Coal	4	6	9	0
Slate, pavement				

Arthur Conley Farm Mine—No. 141 on Map II.

On Stewart Run of Elk, 1.3 miles southwest of Berryburg; Pittsburgh Coal; elevation, 1390′ B.

			Ft.	In
Slate				
Coal	4′	0″		
Coal, harder	0	5		
Coal	4	9	9	2
Slate, pavement				

Only 6′ 2″ of the above coal is mined, the remainder being left up for roof.

J. A. Wentz Farm Mine—No. 142 on Map II.

On a branch of Elk, 1.1 miles northwest of Elk City; Pittsburgh Coal; elevation, 1430′ B.

			Ft.	In
Slate				
Coal	0′	6″		
Slate	0	1		
Coal	2	2		
Coal, bony	0	5		
Coal	3	7	6	9
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 142** in the table of coal analyses at the end of this Chapter.

Pittsburgh Coal, Union District, Barbour.

The Pittsburgh Coal occupies a large acreage in the western third of Union District, but in the region east of Volga its horizon is above the hilltops. It has been opened frequently for farm use but has not been mined commercially although the Century Coal Company has driven a shaft down to it. The several openings noted by Teets are given on the following pages:

Taylor Ward Farm Mine—No. 143 on Map II.

On Gnatty Creek, 0.6 mile northwest of Peeltree; **Pittsburgh Coal;** elevation, 1265′ B.

	Ft.	In.
Coal (with slate roof and pavement)...........	6	4

A sample was collected from this opening for analysis, the composition of which is published under **Mine No. 143** in the table of coal analyses at the end of this Chapter.

Besides the opening just given above, numerous others have been made along Gnatty Creek, where the coal has a good development. The **N. B. White Farm Mine (No. 144 on Map II),** located at Peeltree, showed 7′ 4″ of clean coal, at an elevation of 1235′ B. The **Hansford Bean Farm Mine (No. 145 on Map II),** located on Peeltree Run, 1.2 miles northeast of Peeltree village, measured 5′ 10″ of clean coal, at an elevation of 1250′ B. The **Floyd Bean Farm Mine (No. 146 on Map II),** located on a branch, 0.6 mile east of Peeltree, measured 5′ 1″, with an elevation of 1210′ B. The **William Arnold Farm Mine (No. 147 on Map II),** located on Right Branch, 1.1 miles west of Century, showed 7′ 1″ of clean coal, at an elevation of 1215′ B. The **Frank Maxwell Farm Mine (No. 148 on Map II),** measured 6′ 3″ of clean coal, at an elevation of 1205′ B. The **A. H. Young Farm Mine (No. 149 on Map II),** located on a branch of Crane Fork, 1.7 miles east of Peeltree, measured 7′ 6″ of clean coal, at an elevation of 1230′ B.

Columbia Brown Farm Mine—No. 150 on Map II.

On Crane Fork of Gnatty Creek, 2.3 miles east of Peeltree; **Pittsburgh Coal**; elevation, 1270′ B.

			Ft.	In.
Slate				
Coal	4′	0″		
Coal, hard	0	10		
Coal	3	0	7	10
Slate, pavement				

Huffman Trimble Farm Mine—No. 151 on Map II.

On Crane Fork of Gnatty Creek, 2.2 miles northeast of Peeltree; **Pittsburgh Coal**; elevation, 1250′ B.

			Ft.	In.
Slate				
Coal	3′	2″		
Coal, hard	0	8		
Coal	3	10	7	9
Slate, pavement				

The **Huffman Trimble Farm Mine (No. 152 on Map II)**, located on the head of Crane Fork, 2.6 miles northeast of Peeltree, measured 7′ 2″ of clean coal, with an elevation of 1270′ B. The **Dr. Isaac Smith Farm Mine (No. 153 on Map II)**, located on Crane Fork, 1.2 miles northwest of Simon, showed 7′ 4″ of clean coal, at an elevation of 1330′ B.

Lee Morrison Farm Mine—No. 154 on Map II.

On Crane Fork, 1.5 miles northwest of Simon; **Pittsburgh Coal**; elevation, 1300′ B.

			Ft.	In.
Slate				
Coal	3′	0″		
Coal, hard	0	8		
Coal	3	4	7	0
Slate, pavement				

The **Ephraim Johnson Farm Mine (No. 155 on Map II)**, located on Left Branch, 1.7 miles northeast of Century, measured 7′ 1″ of clean coal, at an elevation of 1280′ B. The **Icy Post Farm Mine (No. 156 on Map II)**, located on Left Branch. 1.3 miles northeast of Century, showed 7′ 0″ of clean coal, at an elevation of 1275′ B. The **Columbus Crites Farm Mine (No. 157 on Map II)**, located on Left Branch, 2.1 miles northeast of Century, measured 7′ 0″ of clean coal. The **Dora Hickman Farm Mine (No. 158 on Map II)**, located on Left Branch 2.1 miles northeast of Century, showed 7′ 6″ of clean coal, at an elevation of 1350′ B.

A few openings have been made along Indian Fork of Elk. The **Arnett Queen Farm Mine (No. 159 on Map II)**, located 0.3 mile west of Simon, showed 5′ 1″ of clean coal, at an elevation of 1400′ B. The **E. H. Chapman Farm Mine (No. 160 on Map II)**, located 0.4 mile northwest of Simon, measured 5′ 3″ of clean coal, at an elevation of 1395′ B.

At **Exposure No. 161 on Map II**, on a branch of Big Run of Buckhannon River, 1.5 miles northwest of Volga, the coal is visible in the county road, showing a thickness of 3′ 1″, with an elevation of 1480′ B. Just across the hill southeast of the above exposure, it is visible at **Exposure No. 162 on Map II**, on the head of Rock Run of Pecks Run, 1.3 miles northwest of Volga, being 3′ 0″ thick, at an elevation of 1510′ B.

In the vicinity of Century on Big Run, the Pittsburgh Coal is nearly 200 feet below drainage where it has been shafted through at the **Century Coal Company Prospect (No. 163 on Map II)**, beneath its mine in the Redstone Coal, the thickness of the Pittsburgh being reported 5′ 10″ by Cleo. Swecker, Civil Engineer, of Century, West Virginia.

Pittsburgh Coal, Philippi District, Barbour.

In Philippi District, there are only a few acres of the Pittsburgh Coal, cropping near the tops of the hills at the headwaters of Hackers Creek and Shooks Run, where, so far as known, the coal is not at present being mined. In the remaining part of the District, its horizon belongs above the tops of the hills.

Pittsburgh Coal, Cove District, Barbour.

In Cove District where the Belington Syncline has preserved the Conemaugh Series, along with a few traces of the Monongahela, the Pittsburgh Coal is found in one high ridge in the northern portion next to the Preston Line, between the waters of Sandy Creek and Big Cove Run. There are two small areas, one of which is a mere fragment in the top of the hill, 1.5 miles westward from Colebank. At the other locality the coal is being mined for local use, the following information being obtained:

D. W. Cobun Farm Mine—No. 164 on Map II.

On Sandy Creek, 1 mile southwest of Colebank; **Pittsburgh Coal**; elevation, 1875′ B.; butts, N. 87° W.

				Ft.	In.
1.	Sandstone, gray, soft				
2.	Draw slate, reported 8″ to			0	10
3.	Coal, good, reported 3′ 0″ to	4′	0″		
4.	Coal, soft, columnar	6	6	10	6
5.	Slate, pavement				

A sample was collected from No. 4 of section, the composition of which is published under **Mine No. 164** in the table of coal analyses at the end of this Chapter.

Pittsburgh Coal, Barker District, Barbour.

In Barker District, the Pittsburgh Coal is preserved by the Belington Syncline in a few high ridges north of Belington, where it is fast being mined out for local use. The following openings were found in this region:

James Ramsey Farm Mine—No. 165 on Map II.

On a branch of Sugar Creek, 1.4 miles west of Huffman; **Pittsburgh Coal**; butts, N. 88° W.; elevation, 2150′ B.

			Ft.	In.
Slate, dark			4	0
Coal, somewhat slaty, roof	2′	0″		
Slate, black	0	1		
Coal	6	10		
Slate, black	0	1		
Coal	1	0	10	0
Slate, pavement				

Mollie Coonts Farm Mine—No. 166 on Map II.

On the north branch of Wolf Run, 1.2 miles west of Huffman: **Pittsburgh Coal**; butts, N. 85° W.; elevation, 2135′ B.

				Ft.	In.
1.	Shale, sandy				
2.	**Coal**, soft	1′	8″		
3.	Slate, black	0	1		
4.	**Coal**, medium-hard	8	1		
5.	Slate, gray	0	1		
6.	**Coal**	0	10	10	9
7.	Slate, pavement				

A sample was collected from Nos. 4 and 6 of section, the composition of which is published under **Mine No. 166** in the table of coal analyses at the end of this Chapter.

G. M. and C. C. Right Bros. Farm Mine—No. 167 on Map II.

On Wolf Run, 2.2 miles north of Belington; **Pittsburgh Coal**; elevation, 2140′ B.; butts, N. 85° W.

				Ft.	In.
1.	Sandstone, massive				
2.	**Coal**	1′	8″		
3.	Shale, gray	0	5		
4.	**Coal**	9	0		
5.	Slate, gray	0	2		
6.	**Coal**	1	0	12	3
7.	Slate, pavement				

A sample was collected from Nos. 4 and 6 of section, the composition of which is published under **Mine No. 167** in the table of coal analyses at the end of this Chapter.

The Pittsburgh Coal was once opened at the **Alfred Moore Farm Mine (No. 168 on Map II)**, located at the top of the ridge between two branches of Wolf Run, 1.5 miles north of Belington, with an elevation of 2120′ B., but the place had fallen shut and no measurement could be obtained.

Pittsburgh Coal, Warren District, Upshur.

In Warren District, the Pittsburgh Coal horizon is exposed along the principal streams, but appears to be of minable value only along portions of Pecks Run and Turkey Run, on the extreme head of Hackers Creek, and on Charity

Fork of Gnatty Creek. Elsewhere it seems to be too thin for economic use although its position is usually marked by a thin seam of coal or black slate. Map IV shows the crop of the coal only in those regions where it is known to be of value.

On Charity Fork the coal was observed by Teets at the **Luther Arnold Farm Mine (No. 169 on Map IV),** located 1.8 miles west of Century, where it showed 8′ 9″ of coal, at an elevation of 1250′ B.

On Little Pecks Run, the coal was noted by Teets at **Coal Exposure No. 170 on Map IV,** 1.2 miles northeast of Pecks Run village, being 1′ 6″ thick, at an elevation of 1455′ B.

On a branch of Pecks Run, just east of Pecks Run Station, the coal was once opened at the **Dudley Marple Farm Mine (No. 171 on Map IV),** having an elevation of 1578′ L., and being 36 feet below the Redstone Coal which is opened in the hill above. The Pittsburgh opening had fallen shut and no measurement was obtained.

On Hackers Creek, the coal was noted by Teets at the **Alva Karickhoff Exposure (No. 172 on Map IV),** located on a branch 0.8 mile northeast of Ruraldale, where it had a thickness of 3′ 6″, at an elevation of 1310′ B.

On Turkey Run, the coal was noted at a few points, the following opening, measured by Teets, being the best exposure:

N. W. Loudin Farm Mine—No. 173 on Map IV.

On the left fork of Sugar Run, 1.8 miles southwest of Pecks Run village; **Pittsburgh Coal**; elevation, 1439′ L.

			Ft.	In.
Slate				
Coal	3′	2″		
Coal, hard	0	8		
Coal	3	2	7	0

A sample was collected from this opening, the composition of which is published under **Mine No. 173** in the table of coal analyses at the end of this Chapter.

On the right branch of Sugar Run, the coal was noted by Teets at **Exposure No. 174 on Map IV,** in the county road 1.1 miles south of Pecks Run village, having a thickness of 3 feet, at an elevation of 1480′ B.

At the forks of Turkey Run, near the residence of Houston Radabaugh, 2 miles southwest of Ruraldale, the blossom of the coal is visible at **Exposure No. 175 on Map IV,** being about 1 foot thick, at an elevation of 1430′ B. A test pit was once opened here but little coal was found.

On the divide between two short branches of the Buckhannon River, 1 mile southwest of Pecks Run Station, the blossom of the coal was observed by Teets at **Exposure No. 176 on Map IV,** in the county road, showing a thickness of about 2 feet and having an elevation of 1560′ B.

On the divide between Threelick Run of Turkey Run and a branch of Fink Run, the coal was noted by Teets at **Exposure No. 177 on Map IV,** in the county road, 1.9 miles north of Buckhannon, having a thickness of about 2 feet and an elevation of 1600′ B.

Pittsburgh Coal, Buckhannon District, Upshur.

In Buckhannon District, the horizon of the Pittsburgh Coal is exposed along the waters of Fink Run, but it appears to be of little value. It was noted by Teets at the **Carper Brothers Exposure (No. 178 on Map IV),** on the north branch of Fink, 1.7 miles north of Buckhannon, where there was a thickness of 1′ 6″, at an elevation of 1615′ B., the coal coming 40 feet below the Redstone Coal.

On Wash Run of Fink, 0.4 mile north of Red Rock Station, the coal was once opened at **Prospect No. 179 on Map IV,** at an elevation of 1460′ B., but apparently little coal had been found and the prospect was abandoned.

Quantity of Pittsburgh Coal Available.

The following table shows the probable amount of Pittsburgh Coal available in those Districts where it is found, the acreage being measured by planimeter by Teets in those regions where the crop of the coal is indicated in minable thickness on Maps II and IV:

Probable Amount of Pittsburgh Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Barbour:					
Pleasant	8	11.60	7,424	2,587,115,520	103,484,621
Elk	8	11.65	7,456	2,598,266,880	103,930,675
Union	7	11.30	7,232	2,205,181,440	88,207,258
Philippi	6	0.22	141	36,851,760	1,474,070
Cove	10	.....	2	871,200	34,848
Barker	10	.....	6	2,613,600	104,544
Totals	..	34.77	22,261	7,430,900,400	297,236,016
Upshur:					
Warren	4	14.20	9,088	1,583,493,120	63,339,725
Totals for Area	..	48.97	31,349	9,014,393,520	360,575,741

MINABLE COALS OF THE CONEMAUGH SERIES.

ELK LICK COAL.

The Elk Lick Coal, previously discussed in Chapter VI, page 217, and shown by outcrop lines on Maps II and IV in those regions where it is of possible minable thickness, occurs in considerable quantity along the Belington Syncline in eastern Barbour and also in northeastern and central Upshur, where it has been mined commercially. It is not found in Randolph, as its horizon is everywhere above the hilltops. Its thickness varies from 1 to 5 feet and it usually has impurities of slate and bone that decrease its value greatly. It has furnished a considerable amount of domestic fuel in regions where better coals are not available. Figure 6 shows its probable areal extent.

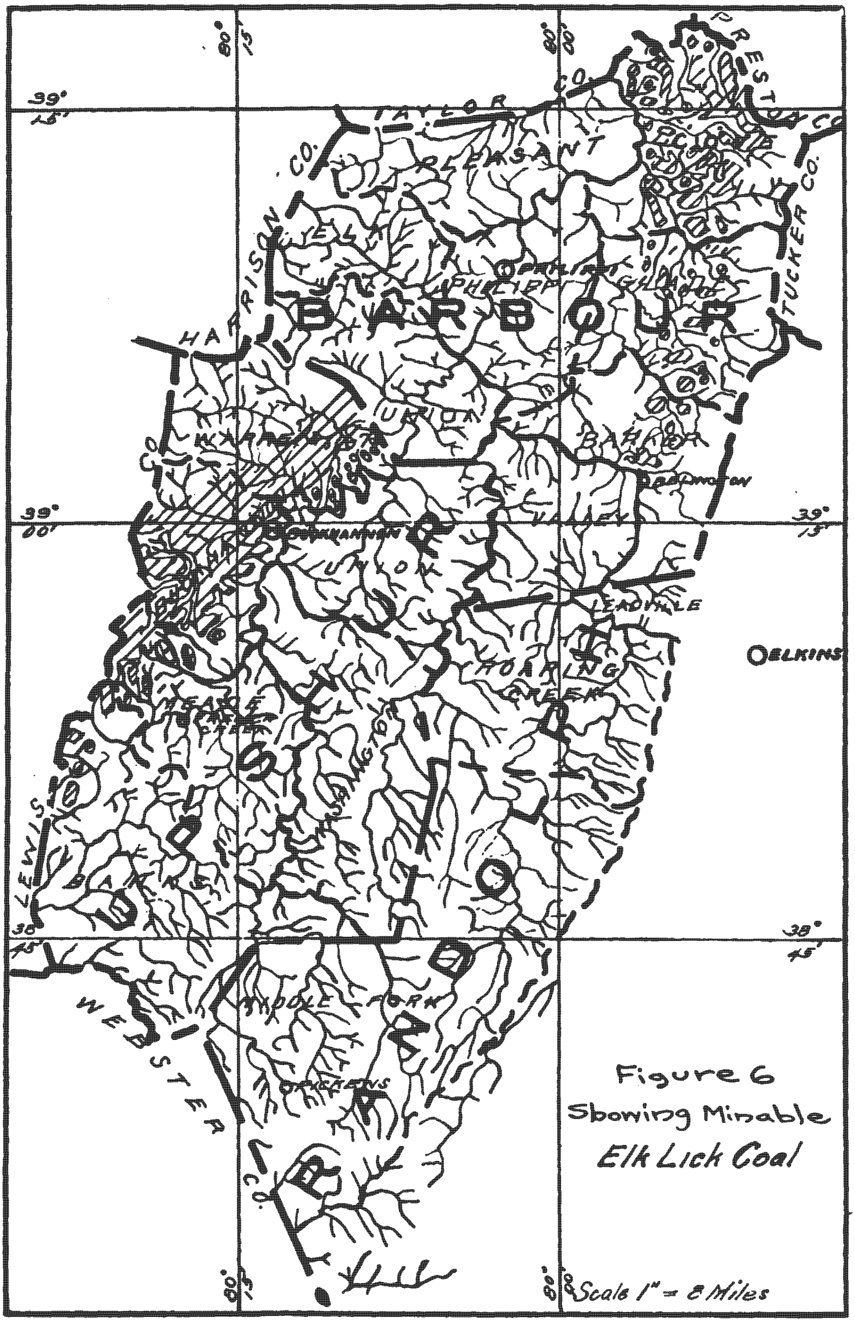

Figure 6
Showing Minable
Elk Lick Coal

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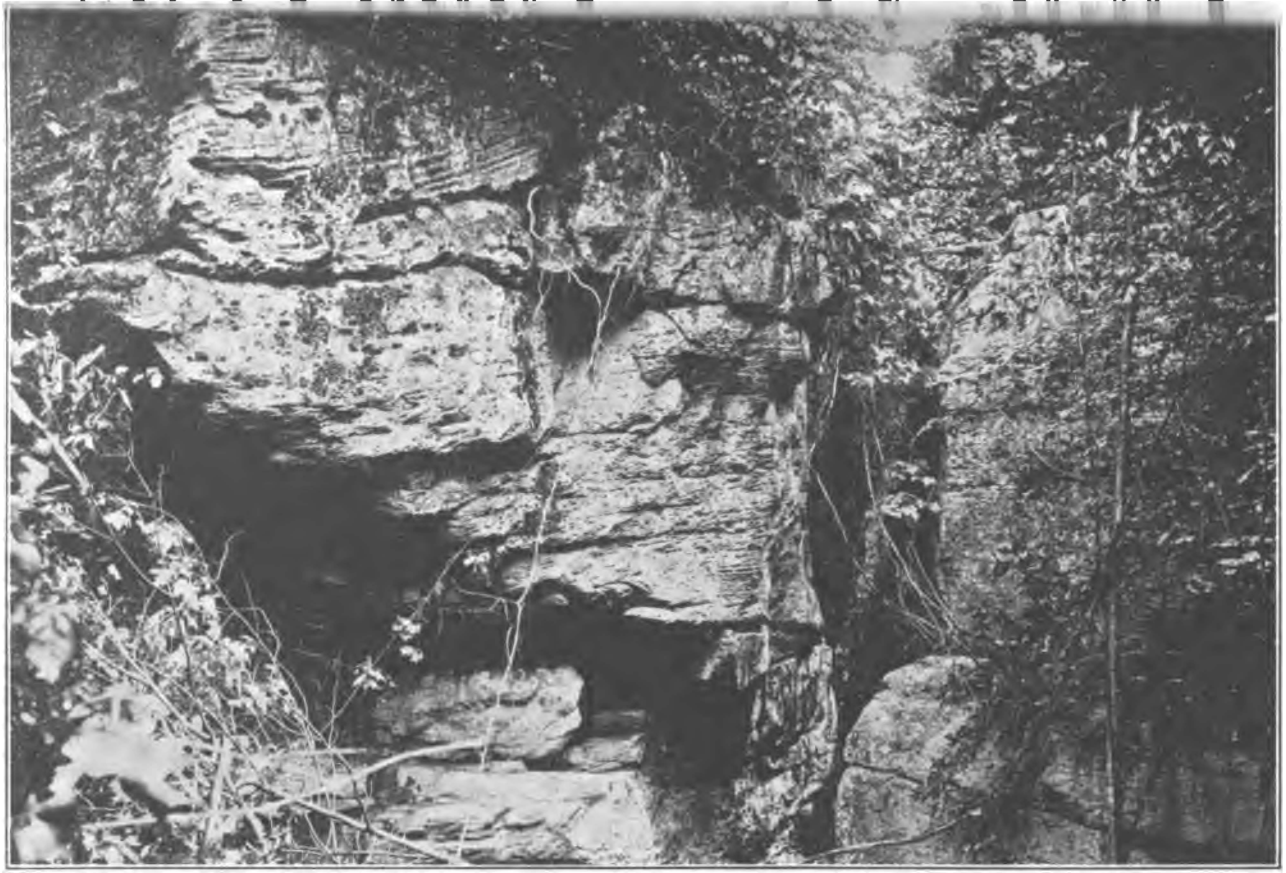

PLATE XXVII.—East Lynn Sandstone cliff at "Split Rock," one-half mile west of Ours Mill, Upshur County.

Elk Lick Coal, Pleasant District, Barbour.

In Pleasant District, the Elk Lick Coal crops along a narrow belt in the eastern central portion of the District but is too thin to be of much value, according to Teets. At **Coal Exposure No. 206 on Map II,** along the public road on waters of Shaw Run, 1.1 miles northwest of Clemtown, it is represented by 4 inches of coal, at an elevation of 1745′ B. Another exposure shows the following:

Coal Exposure No. 207 on Map II.

On Foxgrape Run, along the public road, 0.3 mile west of Switzer; Elk Lick Coal; elevation, 1390′ B.

			Ft.	In.
Limestone, Orlando			2	0
Coal	0′	3″		
Fire clay	1	0		
Coal	1	2	2	5
Slate				

Elk Lick Coal, Elk District, Barbour.

In Elk District, the horizon of the Elk Lick Coal is exposed along the waters of Elk Creek, a short distance west of Elk City, but the coal seems to be of little value. Teets has identified it at **Coal Exposure No. 208 on Map II,** where it crops in the bank of Stewart Run, 2.2 miles northwest of Elk City, at an elevation of 1085′ B., and with a thickness of 1′ 3″.

Elk Lick Coal, Union District, Barbour.

In Union District, the Elk Lick Coal crops along a narrow belt about two miles west of and roughly parallel to the Buckhannon River, but is of little value, being often represented only by a blossom. At **Coal Exposure No. 209 on Map II,** on a branch of Big Run, 0.5 mile southwest of Volga, it is noted in the public road by Teets, at an elevation of 1525′ B., but its thickness is only 0′ 10″. At **Coal Exposure No. 210 on Map II,** on Rock Run, 1.2 miles southwest of Volga, it is noted by Teets in the public road, with a thickness of 1′ 3″, and an elevation of 1460′ B.

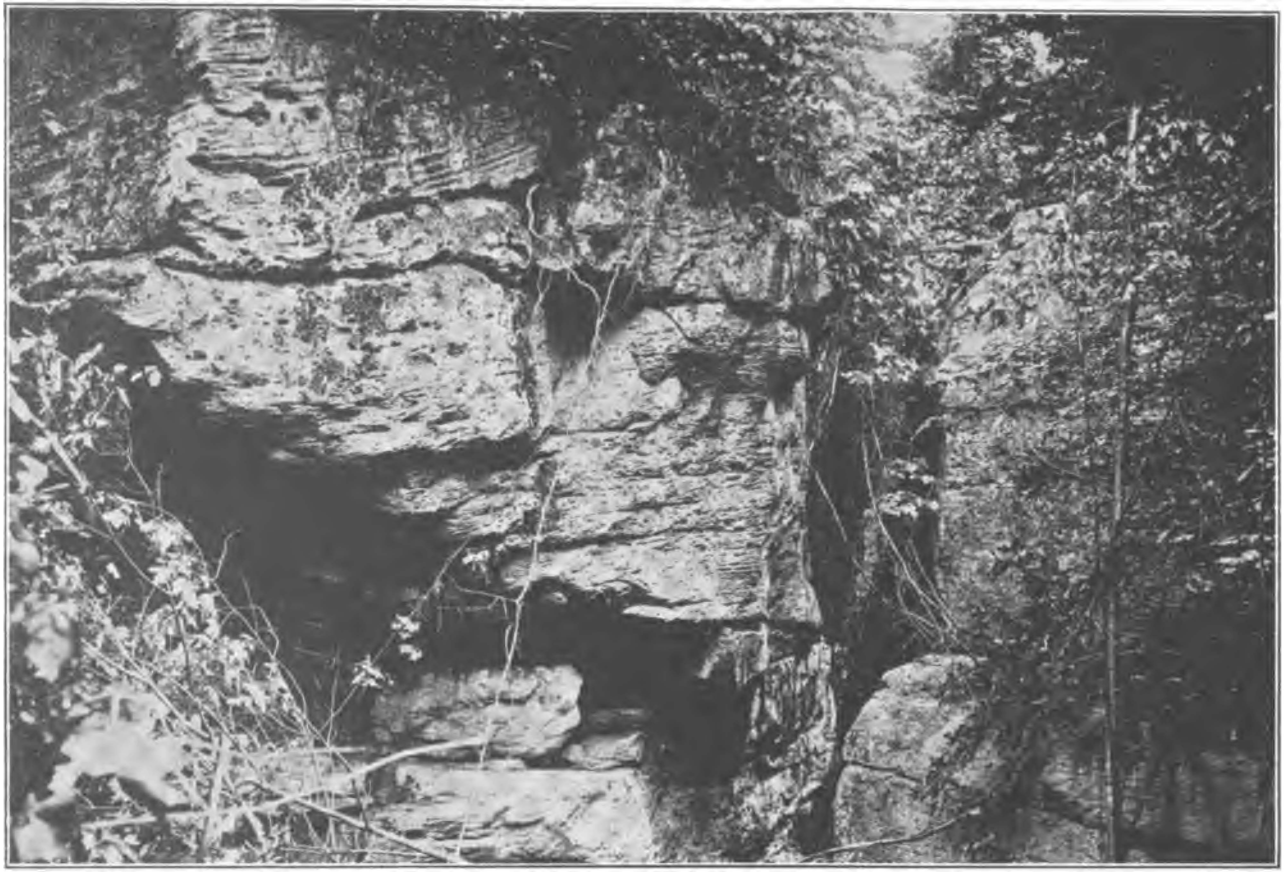

PLATE XXVII.—East Lynn Sandstone cliff at "Split Rock," one-half mile west of Ours Mill, Upshur County.

In the three Districts just described, all lying west of the Buckhannon and Tygart Valley Rivers, the horizon of the Elk Lick Coal belongs under drainage along a wide belt at the western edge, but such borings as are available do not record its presence. Judging by this evidence and by the unfavorable exposures along its crop, the coal can not be considered of possible minable value in this region, and its crop is therefore not shown on Map II in these Districts.

Elk Lick Coal, Cove District, Barbour.

In Cove District, the Elk Lick Coal has been mined at several points for local domestic use. Its thickness varies from 2 to 3 feet, usually with a small slate parting. As shown by Map II, the coal crops high in the hills in those regions where it is found, making the tracts comparatively small and isolated. The following openings were observed:

On Big Cove Run, 1.7 miles southeast of Cove Run Station, at **Coal Exposure No. 211 on Map II,** it was noted in the public road, with a thickness of 2 to 3 feet, and an elevation of 1645′ B. The **C. H. Bolyard Farm Mine (No. 212 on Map II),** located on a branch of Sandy Creek, 1.6 miles northwest of Colebank, at an elevation of 1600′ B., was reported to have measured 3 feet of coal. The **William Thompson Farm Mine (No. 213 on Map II),** located on a branch of Raccoon Creek, 0.5 mile southeast of Danville, measured 3′ 0″ of clean coal, at an elevation of 1655′ B. The following is another opening in the same region:

James Wilson Farm Mine—No. 214 on Map II.

On Raccoon Creek, 1 mile east of Danville; Elk Lick Coal; elevation, 1675′ B.

			Ft.	In.
Slate				
Coal, bony	1′	0″		
Coal, soft, columnar	2	7	3	7
Slate, pavement				

Another opening farther east, and near the line where the coal disappears above the hills on the eastward rise of the rocks, shows the following:

Newton McDaniel Farm Mine—No. 215 on Map II.

On Raccoon Creek, 1 mile south of Colebank; **Elk Lick Coal**; elevation, 1800′ B.

	Ft.	In.
Slate, dark		
Coal	2	8
Slate, pavement		

A sample was collected from this opening, the composition of which is published under **Mine No. 215** in the table of coal analyses at the end of this Chapter.

Other openings farther south show the following:

Elza Howdershalt Farm Mine—No. 216 on Map II.

On Brushy Fork of Teter Creek, 0.6 mile north of Valley Furnace; **Elk Lick Coal**; elevation, 1700′ B.

			Ft.	In.
Shale, sandy			8	0
Slate, black			1	0
Coal	2′	8″		
Slate, dark	0	1		
Coal	0	10	3	7
Slate, pavement				

Scott Phillips Farm Mine—No. 217 on Map II.

On Mill Run of Teter Creek, 1.5 miles east of Nestorville; **Elk Lick Coal**; elevation, 1740′ B.

			Ft.	In.
Sandstone, massive, pebbly, **Morgantown**				
Concealed			5	0
Slate, black cannel			2	0
Coal	2′	7 ″		
Slate, soft	0	0½		
Coal	0	6½	3	2
Slate, pavement				

Elk Lick Coal, Glade and Barker Districts, Barbour.

In Glade District there are only a few isolated areas of the Elk Lick Coal, as the hills along the basin are usually too low to hold it. No openings were observed, probably because the Bakerstown Coal is everywhere accessible near drainage in this region and furnishes a better grade of fuel.

In Barker District, the coal occupies much the same position as in Glade, but a few openings have been made in the region north of Belington. At **Coal Exposure No. 218 on Map II,** located on the divide between the waters of Wolf Run and Tygart Valley River, the coal crops in the public road, at an elevation of 1930′ B., and with a thickness of 1 to 2 feet. The **T. Benton Teter Farm Mine (No. 219 on Map II),** located on Wolf Run, 1.8 miles north of Belington, had fallen shut when examined, but the coal was reported 2 to 3 feet, the elevation being 1900′ B.

Lake Cross Farm Mine—No. 220 on Map II.

On the left branch of Wolf Run, 1.9 miles northeast of Belington; Elk Lick Coal; elevation, 1890′ B.

			Ft.	In.
Shale, sandy				
Coal	1′	1″		
Slate, black	0	1		
Coal	2	6	3	8
Slate, pavement				

Elk Lick Coal, Warren District, Upshur.

In eastern Warren District, the Elk Lick Coal attains a much greater development than in any other region of the two counties. Here it has a thickness of 4 to 6 feet and has been mined commercially. It has sometimes been mistaken for the Pittsburgh seam which belongs about 250 feet higher in the stratigraphic column and would therefore be above the hilltops in the region in which this thick deposit of Elk Lick Coal is found. Several openings have been made along the waters of Pecks Run, reported as follows by Teets:

Thomas Post Farm Mine—No. 221 on Map IV.

On a branch of Pecks Run, 1 mile southeast of Teter; Elk Lick Coal; elevation, 1580′ B.

			Ft.	In.
Shale and slate, roof				
Coal, medium-hard	1′	3″		
Coal, block	2	1		
Coal, very hard	1	0		
Coal, hard	0	11	5	3
Fire clay, pavement				

John Cool Farm Mine—No. 222 on Map IV.

On a branch of Pecks Run, 0.9 mile south of Teter; **Elk Lick Coal**; elevation, 1520′ B.

			Ft.	In.
Shale, sandy, roof				
Coal, medium-hard	1′	3″		
Coal, block	2	0		
Coal, very hard	1	0		
Coal, hard	1	0	5	3
Fire clay, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No.** 222 in the table of coal analyses at the end of this Chapter.

Icy Post Farm Mine—No. 223 on Map IV.

On a branch of Pecks Run, 0.4 mile southeast of Teter; **Elk Lick Coal**; elevation, 1510′ B.

			Ft.	In.
Shale, roof, slaty, not good				
Coal, hard	1′	0″		
Coal, block	2	2		
Bone	0	4		
Coal, hard	1	8	5	2
Fire clay, pavement				

The coal has been mined commercially at Teter Station, but for some time the mine has been closed, making it impossible to secure a section and sample at the working face. The following section, made by Ray V. Hennen near the outcrop when the mine was being opened, has been previously published in Volume II(A), page 631, of the Survey:

Newcomer Coal Company Mine—No. 224 on Map IV.

On Pecks Run at Teter Station; **Elk Lick Coal**; elevation, 1425′ B.

				Ft.	In.
1.	Fire clay shale				
2.	**Coal**, hard, splinty	1′	9″		
3.	Bone	0	2		
4.	**Coal**, hard, splinty	2	2¾		
5.	Bone	0	4		
6.	**Coal**, hard, splinty	2	2½	6	8¼
7.	Slate				

"Butts, east and west; faces, north and south; greatest rise, southeast; mine capacity, 300 tons; authority for mine data, R. H. Parker, Secretary and Treasurer."

No sample was collected at the time of Mr. Hennen's visit because nothing but crop coal was available. It seems probable that the coal characterized as "splinty" should more properly have been termed "bony" instead, as the seam is usually bony and high in ash. Since field work was completed in this locality, the above mine has been reopened under the name of **Pleasant Valley Coal Mining Company,** according to Earl A. Henry, Chief of the West Virginia Department of Mines.

At the **L. D. Hinkle Farm Mine (No. 225 on Map IV),** located on a branch of Pecks Run, 0.9 mile east of Pecks Run Station, the coal was once mined by stripping from the bed of the run, according to Teets, the elevation of the coal being 1450′ B.

The coal was noted by Teets at several points along the Buckhannon River, near the Union District Line. At **Coal Exposure No. 226 on Map IV,** located along the ridge near the river, 1.3 miles northeast of Fishingcamp Station, the coal had a thickness of 5′ 0″ in the public road, the elevation being 1560′ B. At **Coal Exposure No. 227 on Map IV,** on Big Run, 0.7 mile northeast of Fishingcamp Station, the coal was 3′ 2″ thick, as measured in the public road, and had an elevation of 1515′ B. At **Coal Exposure No. 228 on Map IV,** on Big Run, 0.7 mile northeast of Fishingcamp Station, the seam measured 4′ 10″, in the county road, the elevation being 1500′ B. The **Abe Post Farm Mine (No. 229 on Map IV),** located on Big Run, 1.1 miles southeast of Pecks Run Station, at an elevatio of 1500′ B., had fallen shut at the time of Teets' visit and could not be measured. The following opening is along the same run:

G. W. Hinkle Farm Mine—No. 230 on Map IV.

On Big Run, 0.5 mile northeast of Fishingcamp Station; Elk Lick Coal; elevation, 1485′ B.

			Ft.	In.
Slate, roof				
Coal	0′	6″		
Coal, slaty	0	4		
Coal, good	2	9	3	7
Fire clay, pavement				

At **Coal Exposure No. 231 on Map IV**, in the public road, 0.3 mile northeast of Fishingcamp Station, on a branch of Buckhannon River, the coal measured 4′ 0″ thick, at an elevation of 1508′ L. The **Dr. Cooper Rusmisell Farm Mine (No. 232 on Map IV)**, located on a branch, 0.2 mile southeast of Fishingcamp Station, at an elevation of 1505′ B., had fallen shut at the time it was visited by Teets, and could not be measured. The following measurement was made in a railroad cut along the same branch:

Baltimore and Ohio Railroad Coal Exposure—No. 233 on Map IV.

On a branch of Buckhannon River, 0.3 mile north of Fishingcamp Station; Elk Lick Coal; elevation, 1450′ B.

			Ft.	In.
Shale, sandy				
Coal, hard, bony	1′	7″		
Bone	0	2		
Coal, hard, bony	1	1		
Coal, softer	1	5	4	3
Shale, gray			10	0
Limestone, shaly, Elk Lick			1	0
Shale, gray, to grade			2	0

At the **Adam Post Farm Mine (No. 234 on May IV)**, on Buckhannon River, 0.2 mile northeast of Post Mill, the coal had once been opened at an elevation of 1470′ B., but the mine had fallen shut at the time of the writer's visit At **Coal Exposure No. 235 on Map IV**, on the Buckhannon River, 0.3 mile north of Post Mill, the coal is reported by Teets in the public road at an elevation of 1420′ B., and with a thickness of 2′ 3″. At the **Webster Dix Water Well (Coal Locality No. 236 on Map IV)**, on the Buckhannon River, 1.3 miles northwest of Post Mill, the coal is reported to have been found at a depth of 50 feet in the well and with a thickness of 2 to 3 feet, making the elevation of the seam 1380′ B., according to Teets.

Elk Lick Coal, Buckhannon District, Upshur

In Buckhannon District, a few openings have been made in the Elk Lick Coal, but they do not show as good a thickness as those noted for Warren. The quality of the coal is much the same, being of only medium grade. The **William Post Farm Mine (No. 237 on Map IV),** located on the Buckhannon River, just west of the Heavner Cemetery, and 0.8 mile northeast of Buckhannon, had fallen shut when it was visited by Teets, and could not be measured, the elevation being 1455′ B. The coal was once opened at **Exposure No. 238 on Map IV,** on Academy Hill, at the south edge of Buckhannon, at an elevation of 1525′ B., but apparently not much coal was found.

Several openings have been made along the western edge of the District next to the Lewis County Line, on the waters of Stonecoal Creek and other streams. The **Marcellus Reger Farm Mine (No. 239 on Map IV),** on Spruce Fork, 0.5 mile southwest of Atlas, had fallen shut when the place was visited, the elevation of the coal being 1320′ B. At **Coal Exposure No. 240 on Map IV,** on Glade Fork, 1.2 miles south of Atlas, the coal is visible in the public road at an elevation of 1445′ B., and with a thickness of 1′ 6″, being about 4 feet below the Orlando Limestone. The **John Smith Farm Mine (No. 241 on Map IV),** on Brushlick Run, 1.9 miles northeast of Abbott, had fallen shut when it was examined, but at a near-by outcrop, the coal measured 2′ 0″, at an elevation of 1405′ B., being 40 feet by hand-level above the Harlem Coal.

The **Luther Smith Farm Mine (No. 242 on Map IV),** located on Pigeonroost Run of Stonecoal Creek, 2.1 miles northwest of Abbott, measured 2′ 6″ of coal, at an elevation of 1400′ B. At **Coal Exposure No. 243 on Map IV,** located on the divide between Glade Fork and Cutright Run, 1.3 miles northwest of Hinkleville, the coal showed a thickness of about 1 foot, at an elevation of 1640′ L.

Elk Lick Coal, Union District, Upshur.

In Union District, a large amount of Elk Lick Coal has been mined in the region east of Buckhannon and wagoned into town for steam and domestic use, the following openings being noted:

J. W. Heavner Farm Mine—No. 244 on Map IV.

On Buckhannon River, 1 mile northeast of Buckhannon; **Elk Lick Coal**; elevation, 1515′ B.

				Ft.	In.
1.	Slate, black				
2.	**Coal**, slaty	0′	2″		
3.	Slate, black	0	4		
4.	**Coal**	3	8	4	2
5.	Slate, pavement				

A sample was collected from No. 4 of section, the composition of which is published under **Mine No. 244** in the table of coal analyses at the end of this Chapter. This mine has furnished a large amount of fuel for the town of Buckhannon, being now operated by **Raymond J. Bennett.**

At the **Baltimore and Ohio Railroad Coal Exposure (No. 245 on Map IV),** in the Leonard cut along the Buckhannon River, 1.3 miles northeast of Buckhannon, the coal varies from 1 to 3 feet, coming just below the Orlando Limestone, and having an elevation of 1445′ B. The **R. A. Reger Farm Mine (No. 246 on Map IV),** located on the Buckhannon River along the Parkersburg and Staunton Turnpike, 1 mile east of Buckhannon, had fallen shut when it was visited and could not be measured, the elevation being 1520′ B. A large amount of coal was formerly hauled into town from this mine. The coal was once opened at **Farm Mine No. 247 on Map IV,** located on a branch of Buckhannon River, 1.6 miles east of Buckhannon, at an elevation of 1560′ B. According to Teets, the following mine supplies the public schools and college at Buckhannon, requiring an output of 30,000 to 40,000 bushels a year:

Martin Harper Farm Mine—No. 248 on Map IV.

On a branch of Buckhannon River, 0.8 mile northwest of Reger; Elk Lick Coal; butts, S. 85° W.; elevation, 1575' B.

				Ft.	In.
1.	Slate				
2.	Coal, impure	0'	3"		
3.	Coal, hard	1	5		
4.	Slate, dark	0	3		
5.	Coal, bony	0	4		
6.	Coal, block	1	9		
7.	Coal, harder	0	8	4	8
8.	Slate				

A sample was collected from this opening, the composition of which is published under **Mine No. 248** in the table of coal analyses at the end of this Chapter.

Another opening in the same vicinity shows the following, according to Teets:

Harper Brothers Farm Mine—No. 249 on Map IV.

On a branch of Buckhannon River, 1 mile northwest of Reger; Elk Lick Coal; elevation, 1543' L.

			Ft.	In.
Slate, roof				
Coal, impure	0'	5"		
Coal, hard	1	11		
Slate, gray	0	3		
Coal, bony	0	5		
Coal, softer	1	0		
Coal, hard	0	10	4	10
Slate, pavement				

The **Cyrus Hinkle Farm Mine (No. 250 on Map IV)**, located on Childers Run, 1.3 miles northeast of Reger, at an elevation of 1670' B., had fallen shut when visited by Teets and could not be measured.

Quantity of Elk Lick Coal Available.

The following table shows the probable amount of Elk Lick Coal available in those Districts where it is found in possible minable thickness, the acreage being measured by planimeter by Teets in those regions where the crop of the coal is indicated on Maps II and IV, and including a westward probable extension under drainage as far as indicated on Figure 6:

Probable Amount of Elk Lick Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Barbour:					
Cove	2	11.40	7,296	635,627,520	25,425,101
Glade	2	1.43	915	79,714,800	3,188,592
Barker	2	3.27	2,093	182,342,160	7,293,686
Totals	..	16.10	10,304	897,684,480	35,907,379
Upshur:					
Warren	4	13.00	8,320	1,449,676,800	57,987,072
Buckhannon	2	21.60	13,824	1,204,346,880	48,173,875
Union	4	0.75	480	83,635,200	3,345,408
Meade	2	4.50	2,880	250,905,600	10,036,224
Banks	2	2.20	1,408	122,664,960	4,906,598
Totals	..	42.05	26,912	3,111,229,440	124,449,177
Totals for Area	..	58.15	37,216	4,008,913,920	160,356,556

BAKERSTOWN COAL.

The Bakerstown Coal, discussed previously in Chapter VI, page 229, and shown by outcrop lines on Map II in those regions where it is of possible minable value, occurs in considerable quantity along the Belington Syncline in eastern Barbour. In that region it varies from 2 to 3 feet in thickness, is usually free from slate partings, but frequently has bony coal in the top of the seam. It has been mined extensively, often by stripping, for domestic use, a purpose for which it is well adapted. West of the Tygart Valley River, the coal does not seem to be of minable value except in the extreme eastern end of Pleasant District where it has been opened at a few points. Elsewhere along its crop it is thin and slaty or absent entirely, and the oil and gas tests where it lies under drainage do not record it in valuable thickness.

In Upshur County, only a few openings have been made in this coal, nearly all of which have shown it to be too thin or slaty to be of economic value. Its blossom is frequently found but usually shows only a small amount of coal.

In Randolph the horizon of the Bakerstown is above the hilltops. Figure 7 shows its probable areal extent as a minable seam.

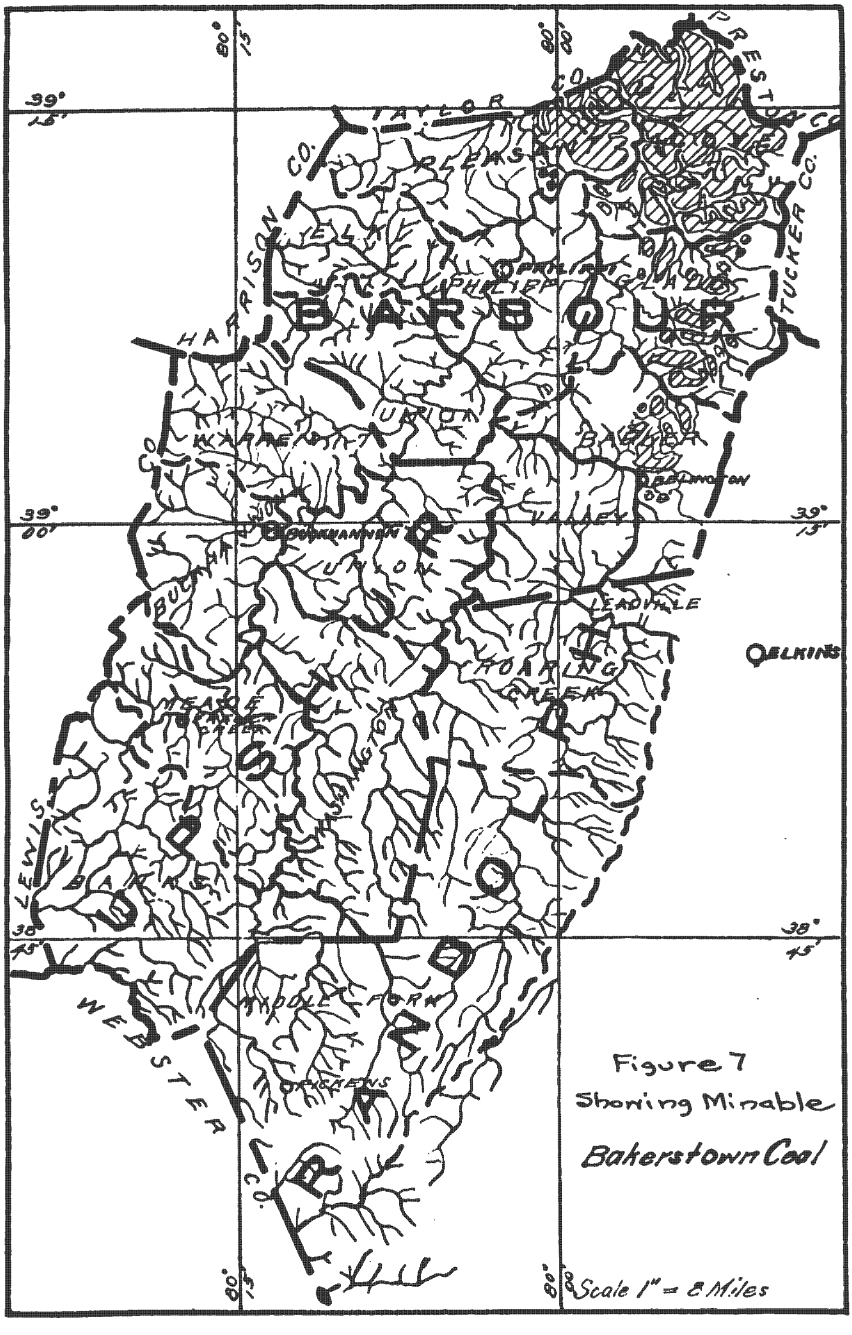

Figure 7
Showing Minable
Bakerstown Coal

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Bakerstown Coal, Pleasant District, Barbour.

In the eastern end of Pleasant District, several openings in the Bakerstown are reported by Teets in the region bordering along the Tygart Valley River, the seam being of fair thickness, but usually much damaged by slate partings, as the following will show:

Thomas Mitchell Farm Mine—No. 275 on Map II.

On the Tygart Valley River, 0.6 mile southwest of Moatsville; Bakerstown Coal; elevation, 1675′ B.

			Ft.	In.
Slate				
Coal	0′	11″		
Slate	0	5		
Coal	2	7	3	11
Slate, pavement				

Joseph Mitchell Farm Mine—No. 276 on Map II.

On the Tygart Valley River, 1.4 miles southwest of Moatsville; Bakerstown Coal; elevation, 1715′ B.

			Ft.	In.
Slate				
Coal	0′	6″		
Slate	0	2		
Coal	0	2		
Slate	0	5		
Coal	2	6	3	9
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 276** in the table of coal analyses at the end of this Chapter.

The **Ira Shaffer Farm Mine (No. 277 on Map II)**, located on a branch of Tygart Valley River, 1.4 miles west of Moatsville, at an elevation of 1705′ B., had fallen shut at the time of Teets' visit, but a thickness of 4 feet was reported. The coal was once mined at the **Allen Duckworth Farm Mine (No. 278 on Map II)**, on Rockcamp Run, 0.7 mile southwest of Clemtown, at an elevation of 1645′ B., but the opening was abandoned because the seam proved to be too irregular for mining. The **N. S. Haddix Farm Mine (No. 279 on Map II)**, on Rockcamp Run, 1.5 miles southwest of Clemtown, now fallen shut, is reported to have shown an irregular thickness of 1½ to 3 feet of coal, at an elevation of 1575′ B.

Bakerstown Coal, Elk, Union, and Philippi Districts, Barbour.

In Elk and Union Districts, the Bakerstown Coal crops over an extensive area west of the Tygart Valley River, but is represented usually only by a blossom. In Philippi District, it was noted at numerous points but seems too thin for mining in that portion west of the river. It is reported by Teets at **Coal Exposure No. 280 on Map II,** on a branch of Hackers Creek, 1.3 miles northwest of Philippi, with a thickness of 1′ 4″ and an elevation of 1480′ B., being visible in the public road. The following exposure was noted in the public road, farther south:

Coal Exposure—No. 281 on Map II.

On the ridge west of the Tygart Valley River, 0.6 mile southwest of Mansfield; **Bakerstown Coal**; elevation, 1565′ B.

			Ft.	In.
Shale, sandy, dark			10	0
Coal	0′	4″		
Slate	0	1		
Coal	1	2	1	7
Fire clay shale				

East of the Tygart Valley River, the coal was noted at **Exposure No. 282 on Map II,** in the public road along the ridge west of Olive Hill Schoolhouse, 2.7 miles east of Philippi, being 2 to 3 feet thick, and having an elevation of 1970′ B.

Bakerstown Coal, Cove District, Barbour.

In Cove District, the Bakerstown Coal has been frequently mined for local use, and has a thickness sufficient to make it a valuable fuel resource, as the following openings will show:

The **S. C. Moats Farm Mine (No. 283 on Map II),** located near the head of a small branch of Tygart Valley River, 1.7 miles southwest of Moatsville Station, had fallen shut when visited, but the coal was reported 3 feet thick, its elevation being 1785′ B.

Several openings have been made along Little Cove Run. **Coal Opening No. 284 on Map II,** located 1.3 miles south of Claude, at an elevation of 1460′ B., had fallen shut. The following shows the section of the coal at another point:

Farm Mine—No. 285 on Map II.

On Little Cove Run, 1.9 miles south of Claude; **Bakerstown Coal;** elevation, 1460′ B.

			Ft.	In.
Sandstone, massive				
Shale, sandy			5	0
Coal, bony	0′	6″		
Coal, soft	2	3	2	9
Slate, pavement				

John Shroyer Farm Mine—No. 286 on Map II.

On Little Cove Run, 1.8 miles northeast of Cove Run Station; **Bakerstown Coal;** butts, N. 85° W.; elevation, 1483′ L.

				Ft.	In.
1.	Slate				
2.	Coal, bony	1′	6 ″		
3.	Coal, cannel	1	2		
4.	Slate	0	0½		
5.	Coal	1	8½	4	5
6.	Slate, pavement				

A sample was collected from the cannel bench, No. 3, and another from the lower bench, No. 5 of section, the analyses of which are published under **Mine No. 286** in the table at the end of this Chapter. The presence of cannel in the seam was not noted elsewhere in the District, and seems to be only a pocket in this particular locality. The **D. M. Carl Farm Mine (No. 287 on Map II),** located on Little Cove Run, 2 miles east of Cove Run Station, had fallen shut, but was reported as 4 feet thick, the elevation being 1485′ B.

Some openings have been made along Oldroad Run **Coal Opening No. 288 on Map II,** located 1.1 miles south of Dent, had an apparent thickness of 2 to 3 feet, but the hole was full of water and could not be accurately measured, the tidal elevation being 1420′ B. **Coal Opening No. 289 on Map II,** located 1.9 miles south of Dent, had fallen shut and could not be measured, its elevation being 1460′ B.

The **Wellington Shroyer Farm Mine (No. 290 on Map II),** on Raccoon Creek at Danville, had partly fallen shut but was reported to have been 4½ feet thick with a slate parting near the middle, its elevation being 1485′ B. **Coal Opening No. 291 on Map II,** on Mill Run of Teter Creek, 1.5 miles southeast of Nestorville, had fallen shut and could not be measured, its elevation being 1625′ B.

Bakerstown Coal, Glade District, Barbour.

In Glade District, the Bakerstown Coal has much the same thickness and character as in Cove, being frequently mined by stripping for domestic fuel, the following openings having been noted:

At **Coal Exposure No. 292 on Map II,** located near the head of Glade Creek, 0.7 mile northeast of Tacy, the coal is visible in the public road with a thickness of 1 to 2 feet at crop, and an elevation of 1615′ B. The **Harry Stalnaker Farm Mine (No. 293 on Map II),** located on a branch of Glady Creek, 0.9 mile west of Kalamazoo, measured 2′ 5″ of medium-hard coal, at an elevation of 1705′ L. At **Farm Mine No. 294 on Map II,** located on a branch of Glady Creek, 0.3 mile west of Kalamazoo, the coal was mined by stripping, 2′ 0″ of coal being visible above the water which filled the bottom of the hole, the elevation being 1670′ B. Another stripping, typical of the coal in this region, showed the following:

D. T. Elliott Farm Mine—No. 295 on Map II.

On a branch of Glady Creek, 0.5 mile south of Kalamazoo; Bakerstown Coal; elevation, 1665′ B.

	Ft.	In.
Soil and sandy shale........................	8	0
Shale, dark................................	4	0

	Ft.	In.
Slate, bony	0	8
Coal	2	6
Slate, pavement		

Another stripping shows the following:

Coal Stripping—No. 296 on Map II.

On a branch of Glady Creek, 1 mile southeast of Kalamazoo; **Bakerstown Coal**; elevation, 1630′ B.

			Ft.	In.
Shale, sandy, dark			3	0
Coal, bony	0′	11″		
Coal, good	3	1	4	0
Slate, pavement				

Coal Stripping No. 297 on Map II, located on Glady Creek, 0.9 mile northeast of Meadowville, was partly fallen shut but showed a thickness of 2 feet, the elevation being 1690′ B.

The coal has been mined at several points on Sugar Creek. At **Coal Stripping No. 298 on Map II,** located on a branch 1.5 miles southeast of Vannoys Mill, the opening had fallen shut, but the coal had been mined extensively, its elevation being 1775′ B. The **Ida J. Poling Farm Mine (No. 299 on Map II),** on a branch, 1.6 miles west of Meadowville, showed 3′ 7″ of coal, being mined by stripping, at an elevation of 1725′ B.

Lorenzo Gainer Farm Mine—No. 300 on Map II.

On a branch of Sugar Creek, 1.5 miles northwest of Flora; **Bakerstown Coal**; elevation, 1695′ B.

			Ft.	In.
Shale, sandy			8	0
Coal, bony	0′	3″		
Coal, good	3	0	3	3
Slate, pavement				

Samuel Moran Farm Mine—No. 301 on Map II.

On Sugar Creek, 0.8 mile southeast of Flora; **Bakerstown Coal**; elevation, 1680′ B.

			Ft.	In.
Shale, sandy				
Coal, bony	1′	6″		
Coal, good	2	10	4	4
Slate, pavement				

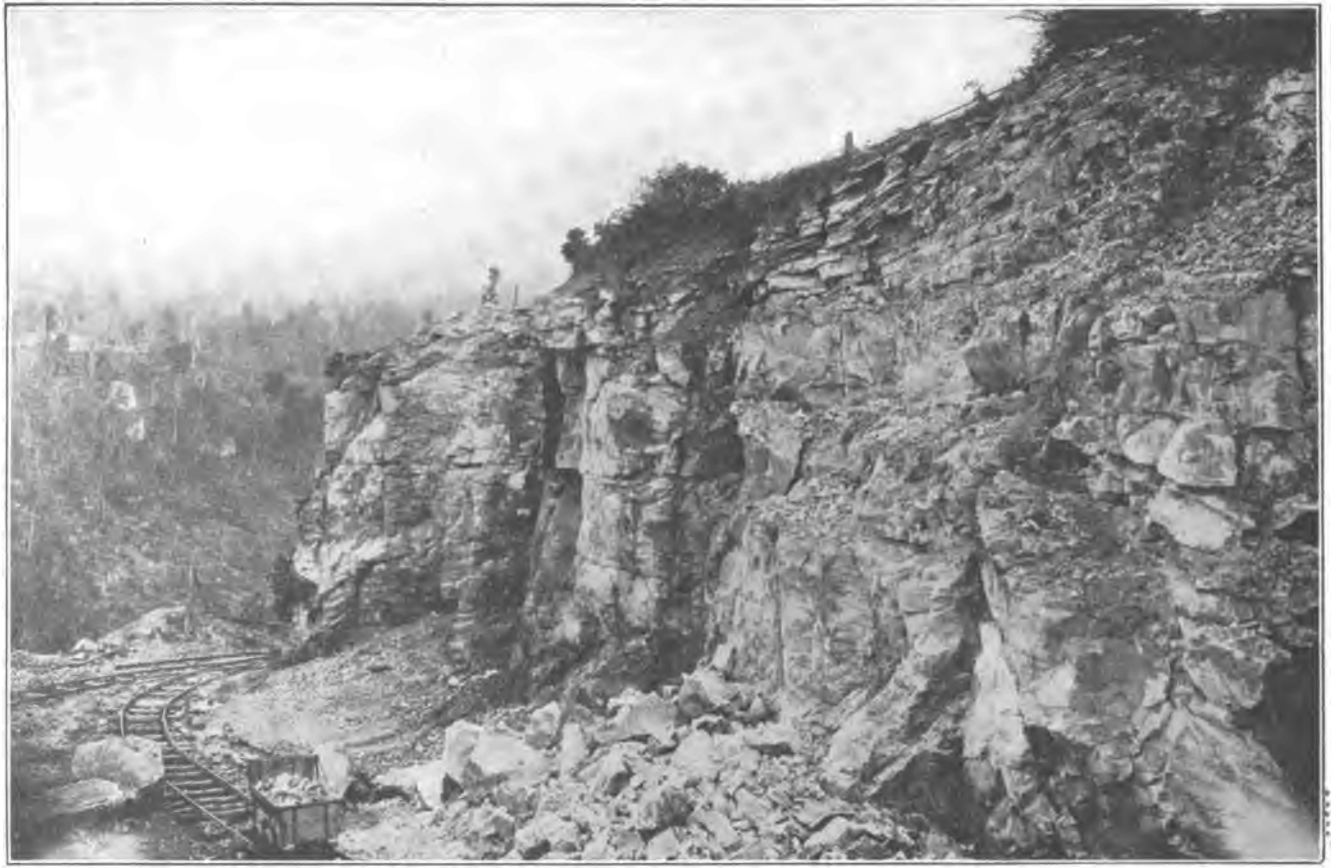

PLATE XXVIII.—East Lynn Sandstone at Imperial Sand Company quarry at Imperial, Upshur County; used for glass-sand.

Bakerstown Coal, Barker District, Barbour.

In Barker District, the Bakerstown Coal has much the same thickness and character as in Cove and Glade, being the chief source of fuel for the farming region north of Belington. Several openings have been made on Bills Creek, as the following will show:

Ridgeway and McClain Farm Mine—No. 302 on Map II.

On Bills Creek, 1.7 miles southwest of Flora; **Bakerstown Coal**; elevation, 1800′ B.

		Ft.	In.
Sandstone, shaly		5	0
Shale, dark		1	0
Coal, bony	0′ 6″		
Coal, good	2 4	2	10
Slate, pavement			

The **William Ridgeway Farm Mine (No. 303 on Map II)**, located 1.8 miles southwest of Flora, was half full of mud but there was an apparent thickness of 2 to 3 feet of coal, its elevation being 1805′ B. At the following opening the coal is mined by stripping:

William J. Koontz Farm Mine—No. 304 on Map II.

On the head of Bills Creek, 1.6 miles west of Huffman; **Bakerstown Coal**; elevation, 1755′ B.

		Ft.	In.
1. Shale, dark		5	0
2. Coal, bony	1′ 1″		
3. Coal, good	2 9	3	10
4. Slate, pavement			

A sample was collected from No. 3 of section, the composition of which is published under **Mine No. 304** in the table of coal analyses at the end of this Chapter. At the **W. L. Harris Farm Mine (No. 305 on Map II)**, located on the head of the creek, 1.8 miles northwest of McLean, at an elevation of 1855′ B., the opening was just being started and had not reached the full thickness of the bed, but showed 2 feet of coal.

Several openings have been made on the waters of Sugar Creek, the following being noted:

A. D. Smith Farm Mine—No. 306 on Map II.

On Sugar Creek, 1.5 miles northwest of Flora; **Bakerstown Coal**; elevation, 1770′ B.

			Ft.	In.
Shale, sandy			3	0
Slate, black			5	0
Coal, bony	0′	4″		
Coal, good	2	10	3	2
Slate, pavement				

The above opening shows the usual character of the soft shales that overlie the coal in this region, making it easy to strip.

George L. Coonts Farm Mine—No. 307 on Map II.

On Sugar Creek, 0.4 mile north of Huffman; **Bakerstown Coal**; elevation, 1655′ B.

			Ft.	In.
Sandstone, shaly				
Shale, dark			1	0
Coal, bony	0′	10″		
Coal, good	2	4	3	2
Slate, pavement				

Howard Wilson Farm Mine—No. 308 on Map II.

On Wolf Run, 0.7 mile south of Huffman; **Bakerstown Coal**; elevation, 1700′ B.

			Ft.	In.
Shale, sandy				
Coal, bony	0′	6″		
Coal, good	2	4	2	10
Slate, pavement				

The coal was once mined at the **James Ramsey Stripping (No. 309 on Map II)**, on Wolf Run, 0.8 mile southwest of Huffman, at an elevation of 1700′ B., but the place had fallen shut and could not be measured.

William Coonts Farm Mine—No. 310 on Map II.

On Wolf Run, 0.9 mile southwest of Huffman; Bakerstown Coal; elevation, 1690′ B.

			Ft.	In.
Shale, sandy				
Coal, bony	0′	8″		
Coal, good	2	7	3	3
Slate, pavement				

The **Henry Harris Farm Mine (No. 311 on Map II)**, located on a branch of Tygart Valley River, 1 mile northwest of McLean, showed 2′ 2″ of coal, according to Teets, at an elevation of 1855′ B.

The following opening is located near the point where the Belington Syncline crosses Tygart Valley River:

Albert Rohrbough Farm Mine—No. 312 on Map II.

On the Tygart Valley River, at the northwest edge of Belington; Bakerstown Coal; elevation, 1755′ B.

			Ft.	In.
Shale, sandy, with iron ore			10	0
Coal	0′	6″		
Slate, black	0	2		
Coal	2	4	3	0
Slate, pavement				

The coal was once opened at the east edge of Belington at the **Jackson Coontz Farm Mine (No. 313 on Map II)**, at an elevation of 1790′ B., but the place had fallen shut and could not be measured.

Bakerstown Coal, Valley District, Barbour.

In Valley District, only a small acreage is covered by the Bakerstown horizon, and as no openings were noted it is doubtful whether the coal is of value. At **Coal Exposure No. 314 on Map II**, at the west edge of Belington, the coal has a thickness of 1′ 3″ in the public road, according to Teets, at an elevation of 1770′ B.

Bakerstown Coal, Warren District, Upshur.

Along the eastern edge of Warren District, the crop of the Bakerstown Coal may frequently be found, but it seems everywhere too thin for mining. At **Coal Exposure No. 315 on Map IV,** on the Buckhannon River, 1.6 miles southeast of Pecks Run Station, the coal is visible in an old road, according to Teets, being 1′ 4″ thick, at an elevation of 1465′ B. At **Coal Exposure No. 316 on Map IV,** located along the Buckhannon River, 1.5 miles northwest of Hinkle, the coal is also reported by Teets, at an elevation of 1500′ B., and with a thickness of 1′ 2″.

Bakerstown Coal, Buckhannon District, Upshur.

In Buckhannon District, the Bakerstown Coal shows the same scanty development as in Warren. In the western edge next to Lewis County, there are a few exposures of this coal along Spruce Fork of Stonecoal Creek. **Coal Exposure No. 317 on Map IV,** located 1.2 miles southwest of Atlas, showed 1 foot of slaty coal, at an elevation of 1180′ B. **Coal Exposure No. 318 on Map IV,** located 1.3 miles southwest of Atlas, showed 1 foot of slaty coal, at an elevation of 1210′ B. **Coal Exposure No. 319 on Map IV,** located at the mouth of Bear Run, 1.4 miles southwest of Atlas, showed 1 foot of slaty coal, at an elevation of 1165′ L. **Coal Exposure No. 320 on Map IV,** located 1.8 miles southwest of Atlas, showed about 2 feet of slaty coal, at an elevation of 1165′ B.

Bakerstown Coal, Union District, Upshur.

In Union District, the Bakerstown horizon crops over a considerable area east of Buckhannon, but no merchantable coal is found. The following showing was noted by Teets along a county road:

Coal Exposure—No. 321 on Map IV.

On Childers Run, 1.3 miles northeast of Reger; **Bakerstown Coal**; elevation, 1705' B.

			Ft.	In.
Shale				
Coal	0'	2"		
Shale	0	6		
Coal	0	8	1	4
Fire clay				

Bakerstown Coal, Meade District, Upshur.

In Meade District, the Bakerstown horizon crops over a wide area but appears to show no coal of minable thickness, although its blossom is often found. At the **Samuel Swecker Coal Exposure (No. 322 on Map IV)**, on Beaver Run of Slab Camp of French Creek, 1.6 miles northwest of French Creek village, the coal was once stripped for domestic use, at an elevation of 1455' B., being reported 0' 8" thick, and of good quality.

Bakerstown Coal, Banks District, Upshur.

In northern Banks District, the Bakerstown Coal horizon crops over an extensive area but usually shows only a thin blossom, being always too thin, so far as known, for successful use. At **Coal Exposure No. 323 on Map IV**, on a branch of West Fork River, 1.1 miles north of Rock Cave, the blossom of the coal is visible in the public road with an apparent thickness of about 2 feet and an elevation of 1640' B. At **Coal Exposure No. 324 on Map IV**, on Whites Camp, 0.5 mile southeast of Boyd, the seam is 1 foot thick in the public road, having an elevation of 1640' B. An opening was once made at **Coal Prospect No. 325 on Map IV**, on Whites Camp, 1.1 miles southwest of Rock Cave, at an elevation of 1745' B., but apparently little coal was found.

uantity of Bakerstown Coal Available.

In addition to the coal openings described on the preceding pages, the accompanying table shows a list of oil and gas wells that record Bakerstown Coal in the regions where its horizon is under drainage. Another table is added showing the probable amount of Bakerstown Coal available in those portions of Barbour where it has been previously described as being valuable, the acreage being measured by planimeter by Teets where the crop of the coal is shown on Map II. None is computed for the western edge of Barbour or for any part of Upshur, because, as previously stated, the coal is not thought to be of value in these regions:

List of Oil and Gas Wells Recording Bakerstown Coal.

No. on Map	Name of Well.	Location.	Elevation of Well Mouth. A. T.	Depth to Coal. Feet.	Thickness. Feet.
	Upshur County:				
32	E. W. Post No. 1.....	Johnstown, 0.5 mi. S..	1065B	130	5
40	John Foster No. 1....	Aberdeen, 0.6 mi. E...	1060L	195	2
41	Isaac S. Reger No. 1..	Ruraldale, 2.1 mi. W..	1075B	183	2
43	J. E. Green No. 1...	Buckhannon, 2 mi. W.	1445B	335	3
49	Louvina Linger No. 1	Abbott, 1.6 mi. N. E..	1380B	125	1
50	John Smith No. 1....	Atlas, 2.5 mi. S. W...	1365B	60	2
57	James Duncan No. 1.	Abbott, 1.4 mi. N. W.	1365B	150	2

Probable Amount of Bakerstown Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Barbour:					
Pleasant	2	5.50	3,520	306,662,400	12,266,496
Cove	2	28.00	17,920	1,561,190,400	62,447,616
Glade	3	8.00	5,120	669,081,600	26,763,264
Barker	3	8.60	5,504	719,262,720	28,770,509
Totals		50.10	32,064	3,256,197,120	130,247,885

MINABLE COALS OF THE ALLEGHENY SERIES.

UPPER FREEPORT COAL.

The Upper Freeport Coal, previously discussed in Chapter VII, pages 242-243, and shown by outcrop lines on Maps II and IV in those regions where it is of possible minable thickness, occurs in considerable quantity in eastern Barbour and in central Upshur. In Randolph, its horizon is exposed over a small acreage in some of the hilltops in the northwestern corner, but as no coal was observed the seam is not considered to be of value in that region. In eastern Barbour, the coal varies in thickness from 2 to 6 feet, the seam usually having one or two slate partings, and being somewhat variable and patchy in its occurrence. In central Upshur, its thickness varies from 2 to 6 feet and it is being mined commercially. In both counties it has furnished a large amount of domestic fuel. Figure 8 shows its probable areal extent as a minable seam.

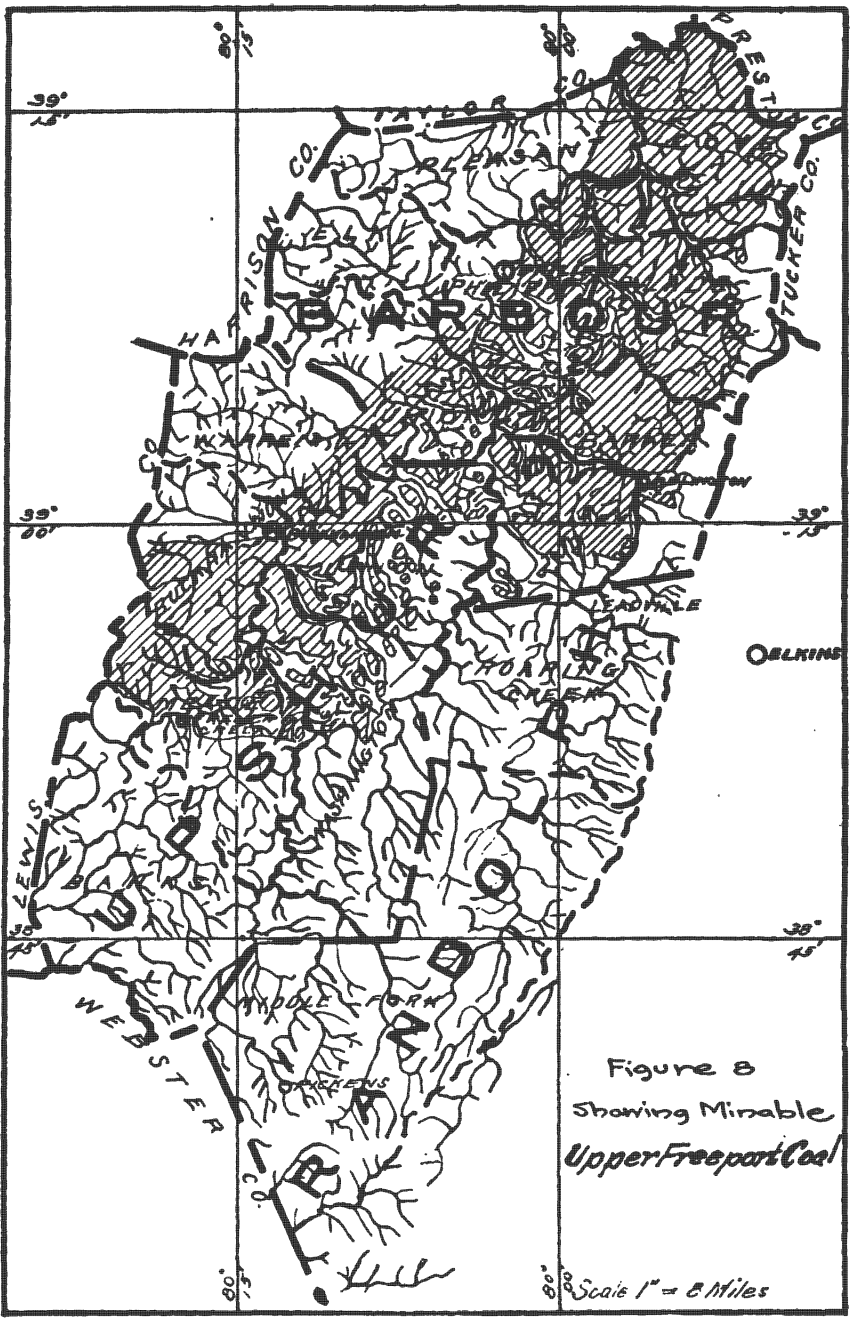

Figure 8
Showing Minable
Upper Freeport Coal

Upper Freeport Coal, Pleasant District, Barbour.

In Pleasant District, the Upper Freeport Coal crops along the extreme eastern edge near the Tygart Valley River, but does not appear to be well developed. It is reported by Ray V. Hennen at **Farm Mine No. 347 on Map II,** located on Lick Run, 1.3 miles southeast of Cecil, at an elevation of 1415′ B., but the place had fallen shut and could not be measured. The following mine was observed by Teets in the same locality, but the exact location of the opening is not indicated on his field map:

G. B. Duckworth Farm Mine.

On the Tygart Valley River front, 1 mile southeast of the mouth of Lick Run; Upper Freeport Coal; elevation, 1535′ B.

			Ft.	In.
Slate				
Coal	3′	1 ″		
Slate	0	0½		
Coal	0	8½	3	10
Slate, pavement				

Upper Freeport Coal, Union District, Barbour.

In Union District, the Upper Freeport Coal has been opened at several points just west of the Tygart Valley River and was once mined commercially on a small scale by shaft. Such openings as are available show it to be thin and slaty. East of the river, it was not observed in minable thickness. Its horizon is exposed at the head of Elk Creek where the following opening is reported by Teets:

Addius Overfield Farm Mine—No. 348 on Map II.

On Elk Creek, 1.3 miles north of Malta; Upper Freeport Coal; elevation, 1275′ B.

	Ft.	In.
Sandstone, flaggy, Mahoning, visible	13	0
Slate, black	0	1
Coal, soft	1	9
Slate		

The coal was once opened at **Coal Prospect No. 349 on Map II**, on a small branch of the Tygart Valley River, 1.5 miles northeast of Volga, at an elevation of 1440′ B., but the place had fallen shut and could not be measured. The **B. E. McCoy Farm Mine (No. 350 on Map II)**, located on the Tygart Valley River, 1.3 miles northeast of Volga, at an elevation of 1470′ B., showed about 2 feet of coal, being partly concealed by mud and water. The following opening had fallen shut but its section was reported to Teets as follows:

C. C. Talbott Farm Mine—No. 351 on Map II.

On Tygart Valley River, 0.8 mile northeast of Volga; Upper Freeport Coal; elevation, 1360′ B.

			Ft.	In.
Slate				
Coal	2′	8″		
Coal, bony	1	2		
Coal	2	0	5	10
Slate, pavement				

Since the completion of field work in Barbour, a new opening has been made in the Upper Freeport Coal, located on the Buckhannon River, one-half mile north of Century Junction, and 60 feet above river level, according to Mr. J. S. Klinefelter, Manager of the operating company. No measurement of the section is available but a sample submitted by Mr. Klinefelter shows the following analysis:

Klinefelter Mine, Montrose Coal Company (No. 351A on Map II).

	Per cent.
Moisture	0.89
Volatile Matter	35.10
Fixed Carbon	48.34
Ash	15.67
Total	100.00
Sulphur	5.06
Phosphorus	0.005

At **Coal Exposure No. 352 on Map II**, on Big Run, 0.7 mile southeast of Volga, the seam is visible in the railroad cut, being 4′ 0″ thick and slaty, with an elevation of 1395′ B.

The coal was once mined by shaft on a small scale at the following opening, the coal reported as being 18 feet below the surface. This mine has been abandoned for several years but the following information was once secured by Ray V. Hennen from Mr. E. Thompson, who had charge of the mine, and has been previously published in Volume II(A), page 611, of the Survey:

Big Run Coal Company Shaft Mine—No. 353 on Map II.

On Big Run, 0.6 mile southeast of Volga; Upper Freeport Coal; elevation of top of shaft, 1378′ B.; base of coal, 1360′ B.

				Ft.	In.
1.	Sandstone				
2.	Slate, black, thin				
3.	Draw slate			0	6
4.	Coal, medium-hard	3′	0″		
5.	Slate, gray and hard	0	2		
6.	Coal, medium-hard	0	6		
7.	Slate, dark-gray	1	6		
8.	Coal, medium-hard	1	0	6	2

A sample was collected by Mr. Hennen from a pile in the boiler house, the composition of which is published under **Mine No. 353** in the table of coal analyses at the end of this Chapter. The high sulphur content (4.53) indicates that possibly the sample does not represent the entire bed. Since field work was done in this locality, the above mine has been reopened, according to Earl A. Henry, Chief of the West Virginia Department of Mines.

The coal is visible at a few points on Pecks Run, near the mouth. At **Farm Mine No. 354 on Map II,** 0.2 mile west of Hall Station, the coal was once opened at an elevation of 1490′ B., but the place had fallen shut and could not be measured.

Baltimore and Ohio Railroad Coal Exposure—No. 355 on Map II.

On Pecks Run, 0.3 mile southeast of Murphy Station; Upper Freeport Coal; elevation, 1400′ B.

			Ft.	In.
Sandstone, massive, Mahoning			25	0
Coal, soft	1′	8″		
Slate, dark	0	2		

			Ft.	In.
Coal	0′	4″		
Slate, dark	0	8		
Coal, slaty	1	5	4	3
Shale, gray			2	0
Sandstone, shaly			2	0
Shale, gray, to grade			5	0

The coal was once opened at the **Sally Lance Farm Mine (No. 356 on Map II)**, located on the Buckhannon River, 0.3 mile west of Hall, at an elevation of 1560′ B., but the place had fallen shut at the time of Teets' visit and could not be measured. Another opening was once made at the **John Fallen Farm Mine (No. 357 on Map II)**, on the head of Laurel Run of Lick Shoals Run, 0.8 mile northwest of Audra, at an elevation of 1875′ B., but, according to Teets, this mine had also fallen shut and could not be measured.

A few exposures were noted by Teets along the Middle Fork River, not far from the Randolph Line. At **Coal Exposure No. 358 on Map II**, located in the county road, 0.4 mile northwest of Audra, the seam showed a thickness of about 3 feet, at an elevation of 1940′ B. It was noted again at the **Elliott Lantz Farm Mine (No. 359 on Map II)**, located 0.5 mile west of Audra, but this also had fallen shut and could not be measured, the tidal elevation being 1930′ B.

Upper Freeport Coal, Philippi District, Barbour.

In Philippi District, the Upper Freeport horizon crops over a considerable area but seldom appears to hold thick enough coal for mining. At **Coal Prospect No. 359A on Map II**, located on Frost Run of Laurel Creek, 1.6 miles northeast of Meriden, the coal was found to be about 2 feet thick, at an elevation of 1765′ B. It was noted at numerous other points in the region east of Philippi, usually by a blossom less than 1 foot thick.

Upper Freeport Coal, Cove District, Barbour.

In Cove District, the Upper Freeport Coal has been mined for local domestic use at numerous points along the flanks of the Belington Syncline. Most of these openings show a thickness of 4 feet or more and the coal is of good quality. The absence of openings or exposures in some neighborhoods indicates that the coal is locally absent or too thin for mining. In the western end of the District, it has been opened and mined along Moats Hollow, as the two following openings will show:

John A. Moats Farm Mine—No. 360 on Map II.

On Moats Hollow of Tygart Valley River, 1.9 miles southeast of Arden; **Upper Freeport Coal**; elevation, 1615′ B.

			Ft.	In.
Shale, sandy				
Coal	2′	9″		
Slate, dark	0	2		
Coal	0	9		
Slate, bony	0	7		
Shale, gray	0	8		
Coal, reported	1	6	6	5
Fire clay				

Farm Mine—No. 361 on Map II.

On Moats Hollow of Tygart Valley River, 2.5 miles southeast of Arden; **Upper Freeport Coal**; elevation, 1615′ B.

			Ft.	In.
Slate, black				
Coal	2′	7″		
Coal, bony	0	7	3	2
Fire clay				

The **Jasper England Farm Mine (No. 362 on Map II)**, located on the Tygart Valley River front, 1.1 miles southwest of Moatsville, at an elevation of 1521′ B., had fallen shut, but according to Mr. England, showed a total thickness of 4 feet, as published in the Moatsville Section, page 106.

Several openings have been made on Teter Creek and its various branches, the following being noted:

Francis Poe Farm Mine—No. 363 on Map II.

On Raccoon Creek of Teter Creek, 1.7 miles southwest of Danville; **Upper Freeport Coal**; elevation, 1335′ B.

			Ft.	In.
Shale, dark, sandy			5	0
Coal, soft	3′	0″		
Slate, dark	0	4		
Coal	1	0	4	4
Slate, pavement				

Another opening (**No. 364 on Map II**), is visible at the mouth of Raccoon Creek, 1.7 miles north of Nestorville, at an elevation of 1370′ B., but this had fallen shut and the coal could not be measured.

H. L. Shaffer Farm Mine—No. 365 on Map II.

On Teter Creek, 1.3 miles north of Nestorville; **Upper Freeport Coal**; elevation, 1375′ B.

			Ft.	In.
Shale, dark				
Coal, soft	2′	0″		
Slate, black, hard	0	3		
Coal	0	7	2	10
Slate, pavement				

Bedford Campbell Farm Mine—No. 366 on Map II.

On Teter Creek, 1.4 miles north of Nestorville; **Upper Freeport Coal**; elevation, 1377′ B.

			Ft.	In.
Slate, black				
Coal, soft	1′	7 ″		
Slate black	0	0½		
Coal	1	1½		
Slate, dark	0	3		
Coal	0	10	3	10
Slate, pavement				

George Shaffer Farm Mine—No. 367 on Map II.

On a branch of Teter Creek, 1.3 miles northwest of Nestorville; **Upper Freeport Coal**; elevation, 1430′ B.

	Ft.	In.
Shale, sandy		

Coal, soft	2′	9″		
Slate, bony	0	2		
Coal	0	10	3	9
Slate, pavement				

Farm Mine—No. 368 on Map II.

On Teter Creek, 0.4 mile north of Nestorville; **Upper Freeport Coal**; elevation, 1415′ B.

	Ft.	In.
Sandstone, massive, **Mahoning**	25	0
Coal, visible	1	6
Concealed by mud and water		

Several openings have been made along Brushy Fork, the following being noted:

The **Charles Shaw Farm Mine (No. 369 on Map II)**, located 1 mile northeast of Nestorville, at an elevation of 1460′ B., showed 2′ 1″ of total thickness, as given in detail in the section for Nestorville, page 104.

Albert Miller Farm Mine—No. 370 on Map II.

On Brushy Fork of Teter Creek, 0.9 mile northeast of Valley Furnace; **Upper Freeport Coal**; elevation, 1530′ B.

			Ft.	In.
Sandstone, massive, **Mahoning**			25	0
Shale, dark, **Uffington**			10	0
Coal	0′	6 ″		
Slate, dark	0	1		
Coal	0	6½		
Slate, dark	0	0½		
Coal	1	2	2	4
Slate, pavement, and concealed to ore digging			5	0

A. C. Gainer Farm Mine—No. 371 on Map II.

On Brushy Fork, 1.3 miles east of Valley Furnace; **Upper Freeport Coal**; elevation, 1670′ B.

			Ft.	In.
Slate, black			0	10
Coal	1′	6 ″		
Slate, dark, hard	0	1½		
Coal	2	5½	4	1
Slate, pavement				

Coal Prospect—No. 372 on Map II.

On Brushy Fork, 1.3 miles northeast of Valley Furnace; Upper Freeport Coal; elevation, 1600′ B.

			Ft.	In.
Sandstone, massive, Mahoning			25	0
Concealed			20	0
Slate, dark			2	0
Coal	1′	8″		
Slate, black, with shaly sandstone	4	0		
Coal	2	0	7	8
Fire clay, Bolivar, flinty, with red iron ore nodules, to creek			25	0

Simon Shaffer Farm Mine—No. 373 on Map II.

On Brushy Fork, 1.9 miles east of Valley Furnace; Upper Freeport Coal; elevation, 1710′ B.

			Ft.	In.
Slate, dark				
Coal	2′	4″		
Slate, dark, hard	0	2		
Coal	0	6		
Shale, gray, hard	1	4		
Coal	0	10	5	2
Slate, pavement				

Some good openings have been made in the immediate vicinity of Nestorville, on the main creek, as the following will show:

Henry Nestor Farm Mine—No. 374 on Map II.

On Teter Creek, at Nestorville; Upper Freeport Coal; elevation, 1425′ B.

			Ft.	In.
Sandstone, massive, Mahoning				
Slate			0	4
Coal, soft, columnar	2′	8″		
Slate, dark	0	2		
Coal	0	10	3	8
Slate, pavement				

The miner at the above opening is authority for the statement that the bottom ply is most favored for smithing purposes.

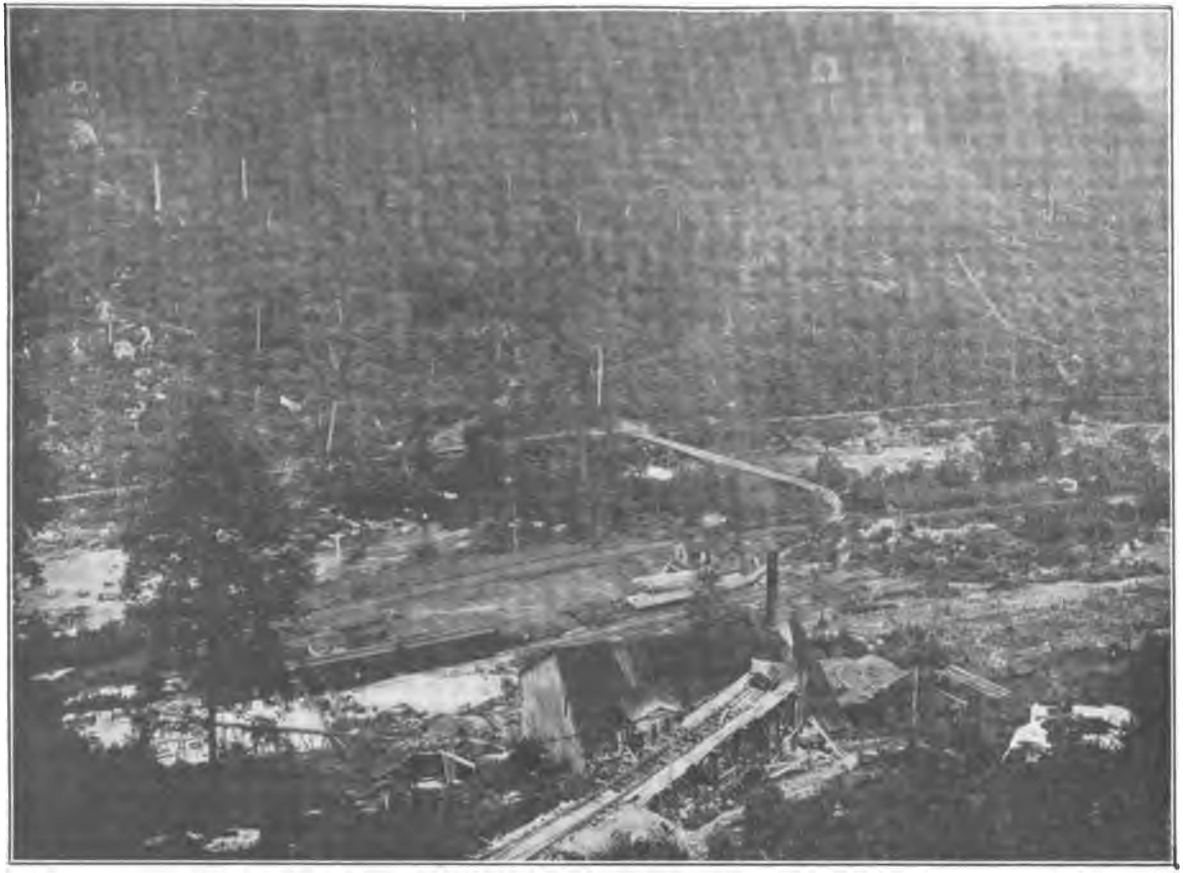

PLATE XXIX.—View at Imperial, Upshur County, looking east across Buckhannon River, showing boulders weathered from East Lynn and Homewood Sandstones; Imperial Sand Company plant in foreground.

A. M. Nestor Farm Mine—No. 375 on Map II.

On Teter Creek, at Nestorville; Upper Freeport Coal; elevation, 1420′ B.; butts, S. 85° W.

				Ft.	In.
1.	Sandstone, massive, Mahoning			25	0
2.	Slate, dark			2	0
3.	Coal, soft	2′	7″		
4.	Slate, dark	0	2		
5.	Coal	1	0	3	9
6.	Slate, pavement				

A sample was collected from Nos. 3 and 5 of section, the composition of which is published under **Mine No. 375** in the table of coal analyses at the end of this Chapter.

The **George Stalnaker Farm Mine (No. 376 on Map II)**, located on Mill Run, 1.4 miles southeast of Valley Furnace, at an elevation of 1665′ B., had partly fallen shut, but about 2′ 6″ of coal was still visible.

Some openings have been made on Glade Run, the following being noted:

Virginia Moats Farm Mine—No. 377 on Map II.

On Glade Run, 0.6 mile southwest of Moatsville village; Upper Freeport Coal; elevation, 1505′ B.

			Ft.	In.
Sandstone, massive, Mahoning, and slate				
Coal, soft	2′	9 ″		
Slate, dark	0	0½		
Coal	0	8½	3	6
Slate, pavement				

The coal is visible again at **Coal Exposure No. 378 on Map II**, in the public road, 2.2 miles west of Nestorville, showing a thickness of about 2 feet, at an elevation of 1710′ L.

Upper Freeport Coal, Glade District, Barbour.

In Glade District, several openings have been made in the Upper Freeport, the coal showing much the same thickness and character as in Cove. The following were noted along Laurel Creek and its branches:

Asa Bennett Farm Mine—No. 379 on Map II.

On Laurel Creek, 0.5 mile southwest of Tacy; **Upper Freeport Coal**; elevation, 1650′ B.

			Ft.	In.
Sandstone, massive, **Mahoning**				
Shale, dark, **Uffington**				
Coal, bony	0′	10″		
Coal, soft	2	9		
Slate, dark, soft	0	1		
Coal	0	8	4	4
Slate, pavement				

G. M. Sturm Farm Mine—No. 380 on Map II.

On Laurel Creek, 1.1 miles northwest of Vannoys Mill; **Upper Freeport Coal**; butts, N. 86° W.; elevation, 1735′ B.

				Ft.	In.
1.	Slate, dark				
2.	**Coal**	2′	11″		
3.	Slate, dark, hard	0	1½		
4.	**Coal**	0	7½		
5.	Shale, gray	1	4		
6.	**Coal**, reported	1	2	6	2

A sample was collected from Nos. 2 and 4 of section, the composition of which is published under **Mine No. 380** in the table of coal analyses at the end of this Chapter.

James Bolyard Farm Mine—No. 381 on Map II.

On Laurel Creek, 1.1 miles northeast of Vannoys Mill; **Upper Freeport Coal**; elevation, 1705′ B.

			Ft.	In.
Slate, dark			5	0
Coal, soft	2′	9″		
Slate, dark	0	1		
Coal	1	1		
Shale, gray, reported	0	5		
Coal, reported	0	6	4	10

W. E. Mouser Farm Mine—No. 382 on Map II.

On Laurel Creek, 0.7 mile north of Vannoys Mill; **Upper Freeport Coal**; elevation, 1755′ B.

	Ft.	In.
Sandstone, massive, pebbly, **Mahoning**		
Slate, dark	1	2

			Ft.	In.
Coal	2′	11″		
Slate, black	0	2		
Coal	0	7	3	8
Slate, pavement				

The three following openings are located on various branches of Sugar Creek:

Claude Trimble Farm Mine—No. 383 on Map II.

On Sand Run of Sugar Creek, 1.1 miles southwest of Vannoys Mill; **Upper Freeport Coal**; elevation, 1830′ B.

			Ft.	In.
Sandstone, massive, pebbly, **Mahoning**				
Shale, dark, **Uffington**			5	0
Coal	2′	9″		
Slate, hard, gray	0	3		
Coal	0	5	3	5
Slate, pavement				

Hartman Stemple Farm Mine—No. 384 on Map II.

On a branch of Sugar Creek, 1.7 miles south of Calhoun; **Upper Freeport Coal**; elevation, 1870′ B.

			Ft.	In.
Sandstone, massive, pebbly, **Mahoning**				
Concealed and black slate, **Uffington**			15	0
Coal	2′	8″		
Slate, gray	0	2		
Coal	0	4	3	2
Slate, pavement				

B. M. Stadurman Farm Mine—No. 385 on Map II.

On a branch of Sugar Creek, 1.7 miles north of Calhoun; **Upper Freeport Coal**; butts, N. 88° W.; elevation, 1865′ B.

				Ft.	In.
1.	Sandstone, massive, pebbly, **Mahoning**				
2.	Concealed			10	0
3.	Shale, dark, **Uffington**			5	0
4.	**Coal**	2″	6″		
5.	Coal, bony	1	0	3	6

A sample was collected from No. 4 of section, the composition of which is published under **Mine No. 385** in the table of coal analyses at the end of this Chapter.

The two following mines are located on the waters o Glady Creek:

Coal Mine No. 386 on Map II, located on a branch of Glady Creek, 1.5 miles northeast of Vannoys Mill, was badly concealed by the water and slate, but the coal appeared to be about 3 feet thick, the elevation being 1610′ B. **Farm Mine No. 387 on Map II,** located on the head of Glady Creek, 1.2 miles southwest of Kirt, at an elevation of 1895′ B., had fallen shut, but there was considerable coal on the dump, indicating that the seam was of workable thickness.

Several openings have been made on the waters of Teter Creek, the following being noted:

W. H. Stalnaker Farm Mine—No. 388 on Map II.

On Big Run of Teter Creek, 1.2 miles north of Kalamazoo; **Upper Freeport Coal**; elevation, 1460′ B.

			Ft.	In.
Shale, dark				
Coal	1′	4½″		
Slate, dark	0	0½		
Coal	1	7	3	0
Slate, pavement				

Washington Digman Farm Mine—No. 389 on Map II.

On Jimmy Run of Teter Creek, 2.6 miles southeast of Nestorville; **Upper Freeport Coal**; elevation, 1775′ B.

			Ft.	In.
Sandstone, **Mahoning**				
Shale, dark, **Uffington**			5	0
Coal, hard, bony	1′	0″		
Coal, medium-hard	1	1	3	1
Slate, pavement				

Coal Exposure—No. 390 on Map II.

In the public road, on a branch of Teter Creek, 1.7 miles northeast of Kalamazoo; **Upper Freeport Coal**; elevation, 1465′ L.

			Ft.	In.
Shale, sandy				
Coal	0′	2″		
Shale, gray	1	0		
Coal	0	5	1	7
Fire clay shale, visible			4	0

Coal Prospect No. 391 on Map II, located 0.2 mile north of Kirt, at an elevation of 1790′ B., had fallen shut when visited, but the coal was reported 1′ 6″ thick.

Upper Freeport Coal, Barker District, Barbour.

In Barker District, the Upper Freeport Coal has been opened and mined for local use at various points, but it is hardly so well developed as in Glade and Cove.

The coal was noted at several places along Bills Creek. At **Coal Exposure No. 392 on Map II,** located 1.5 miles southeast of Calhoun, at an elevation of 1740′ B., there was a total of 2′ 0″ of slaty coal visible in the run. **Coal Prospect No. 393 on Map II,** located 1.3 miles southeast of Calhoun, at an elevation of 1750′ B., had fallen shut and could not be measured. **Coal Prospect No. 394 on Map II,** located 1.3 miles southeast of Calhoun, at an elevation of 1760′ B., had also fallen shut and its thickness was not obtained. The **Edgar Crim Farm Mine (No. 395 on Map II),** located 1.7 miles southeast of Calhoun, at an elevation of 1695′ B., had fallen shut, but the coal was reported 3 to 4 feet thick by William Ridgeway.

One opening was noted on Sugar Creek, as follows:

W. M. Bolton Farm Mine—No. 396 on Map II.

On Sugar Creek, 1.8 miles northwest of Flora; Upper Freeport Coal; elevation, 1605′ B.

			Ft.	In.
Slate, dark			2	0
Coal	3′	0″		
Slate, reported	0	4		
Coal, reported	0	6	3	10

Some openings have been made along Mill Creek, east of the Belington Syncline, the following being noted:

J. M. Cross Farm Mine—No. 397 on Map II.

On Mill Creek, 1.6 miles northeast of Belington; **Upper Freeport Coal**; elevation, 1740′ B.

			Ft.	In.
Sandstone, massive, **Mahoning**				
Coal	1′	0″		
Shale, gray	1	3		
Coal	0	7		
Slate, gray	0	2		
Coal	0	3	3	3
Slate, pavement				

The **Barton Cross Farm Mine (No. 398 on Map II)**, located 1.8 miles northeast of Belington, at an elevation of 1735′ B., was half full of water when visited, the coal being shaly at the mouth of the mine, but being reported 5′ 0″ at the face.

F. J. Booth Farm Mine—No. 398A on Map II.

On Mill Creek, 1.3 miles southeast of Belington; **Upper Freeport Coal**; elevation, 1825′ B.

				Ft.	In.
1.	Slate, dark				
2.	Coal, soft	2′	7″		
3.	Slate, dark	0	2		
4.	Coal	0	9		
5.	Shale, gray	1	2		
6.	Coal	0	11		
7.	Coal, bony	0	7	6	2
8.	Slate, pavement				

A sample was collected from Nos. 2 and 4 of section, the composition of which is published under **Mine No. 398A** in the table of coal analyses at the end of this Chapter.

The coal was once opened at the **D. W. Hillyard Farm Mine (No. 399 on Map II)**, located on a branch of the Tygart Valley River, 1.6 miles southeast of Belington, at an elevation of 1870′ B., but the place had fallen shut when visited, the coal being reported 5 feet thick.

Upper Freeport Coal, Valley District, Barbour.

The Upper Freeport Coal does not seem to be so well developed in Valley District as in the region north of Belington. It was observed at outcrop occasionally, but has been seldom opened for use. The three following are reported by Teets:

Tygart Valley Mineral and Oil Co. Farm (A. P. Lane Opening)—No. 400 on Map II.

On Big Run of Tygart Valley River, 1 mile west of Belington; **Upper Freeport Coal**; elevation, 1695′ L.

			Ft.	In.
Slate				
Coal, soft	2′	1″		
Coal, hard, bony	1	3	3	4
Slate, pavement				

A sample was collected from this coal, the composition of which is published under **Mine No. 400** in the table of coal analyses at the end of this Chapter. Coal from this mine is hauled to Belington for local use.

W. H. Soden Farm Mine—No. 400A on Map II.

On a branch of Middle Fork River, 0.4 mile southwest of Werner; **Upper Freeport Coal**; elevation, 2105′ B.

			Ft.	In.
Slate				
Coal, bony	0′	2 ″		
Coal, soft	1	7		
Shale, gray	0	6		
Coal	0	1		
Slate	0	0½		
Coal, soft	1	0½		
Coal, bony	0	2	3	7
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 400A** in the table of coal analyses at the end of this Chapter. This mine supplies a considerable domestic trade, the yearly output being about 4000 bushels.

The **Riley Taylor Farm Mine (No. 401 on Map II)**, located on the head of McGowan Run of Tygart Valley River, at an elevation of 2010' B., had fallen shut when visited, the coal being reported 2 feet thick.

Upper Freeport Coal, Buckhannon District, Upshur

In Buckhannon District, the Upper Freeport Coal has been mined for local use at several points along the Buckhannon River and tributary streams, being of fair thickness and quality. The **Ira Travis Farm Mine (No. 402 on Map IV),** located at the mouth of Cutright Run, 0.9 mile north of Hampton, at an elevation of 1430' B., had fallen shut when visited but the coal was reported to be 4 feet thick.

Jacob Ervin Cutright Farm Mine—No. 403 on Map IV.

On Cutright Run, 0.8 mile north of Hampton; Upper Freeport Coal; elevation, 1405' B.

			Ft.	In.
Slate, dark				
Coal, medium-hard	2'	10"		
Slate, gray	0	2		
Coal, hard	0	7	3	7
Slate, pavement				

The **Absalom Poling Farm Mine (No. 404 on Map IV),** located on Cutright Run, 0.7 mile northwest of Hampton, at an elevation of 1420' B., had fallen shut when it was visited and the thickness of the coal was not obtained. The **F. G. Cutright Farm Mine (No. 405 on Map IV),** located on the Buckhannon River, 0.3 mile north of Hampton, had fallen shut when it was examined and the thickness of the coal was not obtained, the tidal elevation being 1450' L. The coal has been opened at several points around Hampton but all of the mines have fallen shut. At the **Fred Burner Farm Mine (No. 406 on Map IV),** located at the mouth of French Creek, at the south edge of Hampton, the coal has an elevation of 1495' B. At **Coal Exposure No. 407 on Map IV,** located in the public road on a branch of French Creek, 0.4 mile east of Hinkleville, the coal had once been mined by stripping at an elevation of 1470' B., but the place had fallen shut and could not be measured. At the **William Burner Farm Mine (No. 408 on Map IV),** located on the Buckhannon River, 0.7 mile southeast of

Hampton, at an elevation of 1525′ B., the opening had fallen shut and could not be measured, the thickness of the coal being estimated at 4 to 5 feet from the mines props.

Upper Freeport Coal, Union District, Upshur.

The Upper Freeport Coal has been opened for local use at numerous points in Union District, showing a variable thickness of 2 to 4 feet, according to Teets, who examined these mines.

The **David Wentz Farm Mine (No. 409 on Map IV),** located on Island Run of Buckhannon River, 1.3 miles east of Wentz Ford, showed a thickness of 3′ 2″, at an elevation of 1785′ B.

Several openings have been made along Handy Camp Run of Buckhannon River. The **W. S. Moreland Farm Mine (No. 410 on Map IV),** located 0.4 mile southeast of Wentz Ford, measured 2′ 6″ of block coal, at an elevation of 1690′ B. The **Perry Marteny Farm Mine (No. 411 on Map IV),** located 0.6 mile east of Wentz Ford, showed 3′ 1″ of soft coal, at an elevation of 1745′ B. **Farm Mine No. 412 on Map IV,** located 1.3 miles east of Wentz Ford, at an elevation of 1870′ B., had fallen shut and could not be measured.

Enoch Kesling Farm Mine—No. 413 on Map IV.

On Right Branch of Handy Camp, 1.4 miles southeast of Wentz Ford; Upper Freeport Coal; elevation, 1885′ B.

			Ft.	In.
Sandstone, massive, brown, and pebbly, Mahoning, visible			8	0
Coal	2′	0″		
Slate	0	3		
Coal	0	4	2	7
Slate				

Several openings have been made on Sand Run. At **Coal Opening No. 414 on Map IV,** located 0.8 mile southeast of Wentz Ford, the coal was once mined by stripping, at an elevation of 1730′ B., but the place had fallen shut and the coal could not be measured.

Lee Fortney Farm Mine—No. 415 on Map IV.

On Left Fork of Little Laurel Fork of Sand Run, 2.1 miles northeast of Overhill; Upper Freeport Coal; elevation, 1830′ B.

		Ft.	In.
Sandstone, gray, medium-coarse, with bands of iron oxide, Mahoning, visible		8	0
Shale, gray		0	9
Coal, hard	1′ 3″		
Coal, soft, visible	0 9	2	0

The **Martin Dolan Farm Mine (No. 416 on Map IV)**, located on Little Laurel Fork, 1.6 miles northeast of Overhill, at an elevation of 1743′ L., had fallen shut, but the coal was reported 3 feet thick. **Farm Mine No. 417 on Map IV**, located on Little Laurel Fork, 0.9 mile northeast of Overhill, at elevation of 1848′ L., had fallen shut and could not be measured. The **Martin Dolan Farm Mine (No. 418 on Map IV)**, located on Sand Run, 1.4 miles north of Overhill, had fallen shut, but the coal was reported 3 feet thick, the elevation being 1700′ B. The **William Pifer Farm Mine (No. 419 on Map IV)**, located on a branch 0.6 mile northwest of Overhill, measured 3′ 4″ of soft coal, at an elevation of 1670′ L. The **William Hawkins Prospect (No. 420 on Map IV)**, located 0.9 mile south of Overhill, at an elevation of 1740′ B., had fallen shut and could not be measured.

Some openings have been made along Little Sand Run, at the southern end of the District. The **J. T. Foster Prospect (No. 421 on Map IV)**, located 1.7 miles southeast of Tenerton, at an elevation of 1575′ B., had fallen shut and could not be measured. The **W. U. Zinn Farm Mine (No. 422 on Map IV)**, located 1.1 miles northwest of Ivy, at an elevation of 1655′ B., had also fallen shut. Some other openings along the same run will be mentioned under Washington District.

The coal is found on the tops of the hills at a few points on the Middle Fork River drainage. The **Marshall Bennett Farm Mine (No. 423 on Map IV)**, located on a branch, 0.6 mile southwest of Swamp Run, showed 2′ 3″ of coal, at an elevation of 2010′ B., the entire seam not being visible.

Upper Freeport Coal, Meade District, Upshur.

In Meade District, the Upper Freeport Coal is better developed and more valuable than in any other region of the two counties, often reaching a thickness of more than 6 feet. It is mined commercially on Bull Run of French Creek, where it is a good thick seam.

The coal has been mined at a few points along the Buckhannon River in the Sago region where it lies high in the hills. The following opening is reported by Teets:

George Burner Heirs Farm Mine—No. 424 on Map IV.

On the Buckhannon River, 0.3 mile northwest of Sago; Upper Freeport Coal; elevation, 1602′ L.

			Ft.	In.
Slate				
Coal	0′	11″		
Slate, gray	0	2		
Coal, block	3	0	4	1
Slate, pavement				

At **Coal Exposure No. 425 on Map IV**, the coal is visible on the Buckhannon River-French Creek divide, 0.6 mile southwest of Sago, having an elevation of 1631′ L., the exact thickness not being obtained. At **Farm Mine No. 426 on Map IV**, located 0.6 mile west of Tenmile, the coal measured 2′ 8″ thick, at an elevation of 1930′ B.

Numerous openings have been made on French Creek and its branches, the following being noted:

George Morgan Farm Mine—No. 427 on Map IV.

On a branch of French Creek, 0.4 mile south of Adrian; Upper Freeport Coal; elevation, 1517′ L.

			Ft.	In.
Shale, sandy			5	0
Slate, dark			1	0
Coal, soft	0′	6″		
Coal, hard, bony	0	7		
Coal, soft	2	8		
Shale, gray	0	2		
Coal, soft	1	1	5	0
Slate, pavement				

Ashley Morgan Farm Mine—No. 428 on Map IV.

On a branch of French Creek, 0.5 mile south of Adrian; Upper Freeport Coal; elevation, 1505′ B.

			Ft.	In.
Slate				
Coal, soft	0′	4″		
Coal, bony	0	6		
Coal, soft	3	3½		
Slate, dark, hard	0	1½		
Coal, soft	1	2	5	5
Slate, pavement				

The coal was once opened at **Prospect No. 429 on Map IV**, on Bull Run, 0.6 mile west of Adrian, at an elevation of 1450′ B., but the place had fallen shut and could not be measured.

The Buckhannon River Coal and Coke Company has made several openings along a branch on the north side of Bull Run near Adrian, and mines the coal commercially at one of these places. The following sections of the coal were secured:

Buckhannon River Coal & Coke Co. (Old Opening)—No. 430 on Map IV.

On a branch of Bull Run, 0.5 mile northwest of Adrian; Upper Freeport Coal; elevation, 1460′ B.

			Ft.	In.
Slate				
Coal	0′	6″		
Coal, bony	0	11		
Coal	4	1	5	6
Concealed, pavement?				

Buckhannon River Coal & Coke Co. (Air-Course)—No. 431 on Map IV.

On a branch of Bull Run, 0.6 mile northwest of Adrian; Upper Freeport Coal; elevation, 1460′ B.

			Ft.	In.
Coal	0′	6″		
Coal, bony	0	11		
Coal	3	3		
Slate, black	0	1		
Coal, hard	0	11	5	8
Concealed				

Buckhannon River Coal & Coke Co. Adrian Mine (Main Opening)—No. 432 on Map IV.

				Ft.	In.
1.	Slate, good roof				
2.	Coal, gas, hard	0'	7½"		
3.	Coal, bony	0	9		
4.	Coal, gas, hard	3	0		
5.	Slate, black	0	0½		
6.	Coal, gas, hard	1	1	5	6
7.	Slate				

"Principal office, Uniontown, Pa.; daily capacity, 500 tons; daily output, 150 tons; 18 miners and 15 laborers employed; electric haulage; coal used for steam and domestic fuel and for coke; butts, N. 75° W.; faces, N. 15° E.; greatest rise, southeast; Wade Corley, Foreman, authority for mine data."

The above section was measured by Ray V. Hennen several years ago and has been previously published in Volume II(A), page 612, of the Survey, but the mine data, as they appear above, were revised by the writer in 1915. Mr. Hennen collected a sample from Nos. 2, 4, and 6 of section, the composition of which is given under **Mine No. 432** in the table of coal analyses at the end of this Chapter. According to Mr. Corley, the coal is mined on No. 6, and Nos. 3 and 5 are rejected in the mine. The company has 36 beehive ovens of which 14 were in use in 1915, with an output of 28 tons for each 72 hours, after which the ovens are recharged. A sample of 48-hour coke was collected from these ovens by Mr. Hennen, the analysis of which is as follows:

	Per cent.
Moisture	0.10
Volatile Matter	0.60
Fixed Carbon	85.11
Ash	14.19
Total	100.00
Sulphur	1.31
Phosphorus	0.030

One of the earliest openings of this region was made near the present residence of A. D. Page **(Farm Mine No. 433 on Map IV)**, on Grub Hollow, 0.8 mile northeast of French Creek village, at an elevation of 1520' L., but the place has long ago fallen shut. The coal was opened again at **Farm Mine No. 434 on Map IV**, on Grub Hollow, 0.5 mile northeast of French Creek village, at an elevation of 1520′ L., but the mine had fallen shut and could not be measured. It was also opened at **Farm Mine No. 435 on Map IV**, on French Creek, 0.2 mile north of French Creek village, at an elevation of 1520′ B., but the opening is no longer in use and could not be measured. The following mine is in active operation:

A. D. Page Farm Mine—No. 436 on Map IV.

On French Creek, 1 mile northeast of French Creek village; Upper Freeport Coal; elevation, 1540′ B.

				Ft.	In.
1.	Shale, sandy				
2.	Coal, bony	0′	9″		
3.	Coal, soft	2	1		
4.	Slate, dark	0	2		
5.	Coal, good	1	5	4	5
6.	Slate, pavement				

A sample was collected from Nos. 3 and 5 of section, the composition of which is published under **Mine No. 436** in the table of coal analyses at the end of this Chapter.

Sherman Brady Farm Mine—No. 437 on Map IV.

On French Creek, 0.8 mile east of French Creek village; Upper Freeport Coal; elevation, 1555′ B.

				Ft.	In.
1.	Slate				
2.	Coal, bony	0′	9″		
3.	Coal, soft	3	1		
4.	Slate, dark	0	1½		
5.	Coal, soft	1	9½	5	9
6.	Slate, pavement				

Coal from the above mine supplies a considerable portion of the village of French Creek. A sample was collected from Nos. 3 and 5 of section, the composition of which is published under **Mine No. 437** in the table of coal analyses at the end of this Chapter.

The **Sherman Brady Farm Mine (No. 438 on Map IV)**, located on French Creek, 0.6 mile east of French Creek viliage, had fallen shut and could not be measured, but furnished a large amount of coal before it was finally abandoned. The **Richard P. Young Heirs Farm Mine (No. 439 on Map IV)**, located between the two branches of Brush Run of French Creek, 0.6 mile south of French Creek, at an elevation of 1605′ B., had fallen shut, but was reported 2 feet thick.

Upper Freeport Coal, Washington District, Upshur.

In Washington District, the Upper Freeport Coal has been opened at several points and shows a thickness considerably less than found in Meade District, being usually 2 to 4 feet, according to Teets, who examined this territory.

Some openings have been made along Little Sand Run. The **Ova Fretwell Heirs Farm Mine (No. 440 on Map IV)**, located 1.1 miles east of Tenerton, at an elevation of 1440′ B., had fallen shut and could not be measured. The **Gay Cochran Farm Mine (No. 441 on Map IV)**, located 1.2 miles east of Tenerton, at an elevation of 1475′ B., had also fallen shut and its thickness was not obtained.

Several openings have been made along Hickory Flat Run of Buckhannon River. The **Bruce Brohard Farm Mine (No. 442 on Map IV)**, located 1.5 miles northeast of Hampton, at an elevation of 1462′ L., had fallen shut and could not be measured. The **L. L. Westfall Farm Mine (No. 443 on Map IV)**, located 1.3 miles northeast of Hampton, measured 3′ 1″ of coal, at an elevation of 1477′ L. The **L. L. Westfall Farm Mine (No. 444 on Map IV)**, located 1.4 miles northeast of Hampton, had fallen shut and the thickness of the coal was not obtained. The **D. C. Westfall Farm Mine (No. 445 on Map IV)**, located 1.2 miles east of Hampton, at an elevation of 1555′ B., measured 3′ 2″ of soft coal.

The **R. C. Fox Farm Mine (No. 446 on Map IV)**, located on the Buckhannon River, 0.8 mile southeast of Hampton, showed 2′ 4″ of coal, at an elevation of 1550′ B.

The coal has been opened at several points along Trubie Run of Buckhannon River. The **Harmon Wilfong Farm Mine (No. 447 on Map IV)**, located on a branch, 1.7 miles southeast of Hampton, had fallen shut and could not be measured. The

U. G. Tenney Farm Mine (No. 448 on Map IV), located on a branch, 1 mile west of Ivy, at an elevation of 1635′ B., had fallen shut, but was reported 1′ 8″ thick. **Farm Mine No. 449 on Map IV),** located on a branch, 0.7 mile southwest of Ivy, at an elevation of 1740′ B., had fallen shut and could not be measured.

Several openings have been made along the waters of Sand Run. The **Burt Slaughter Farm Mine (No. 450 on Map IV),** on a branch, 0.3 mile southwest of Ivy, measured 3′ 3″ of coal, at an elevation of 1760′ B. The **Daniel Pence Farm Mine (No. 451 on Map IV),** located on a branch, 0.5 mile southeast of Ivy, showed 3′ 4″ of coal, at an elevation of 1795′ B. The **Clarence Hinkle Farm Mine (No. 452 on Map IV),** located on a branch, 0.7 mile southeast of Ivy, measured 3′ 3″ of soft coal, at an elevation of 1800′ B. The **John Richardson Farm Mine (No. 453 on Map IV),** located on a branch, 0.8 mile southeast of Ivy, at an elevation of 1815′ B., had fallen shut, but was reported to have measured 3 feet of coal. **Coal Exposure No. 454 on Map IV,** located on the main run, 0.3 mile west of Goodwin, showed the blossom of the coal 2 feet thick, at an elevation of 1820′ B.

Quantity of Upper Freeport Coal Available.

In addition to the coal openings described on the preceding pages, the accompanying table shows a list of oil and gas wells that record Upper Freeport Coal in the regions where its horizon is under drainage. Another table is added showing the probable amount of this coal by magisterial districts, the areal extent of which was measured with planimeter by Teets from the surface and underground areas outlined for it on Maps II and IV, and Figure 8.

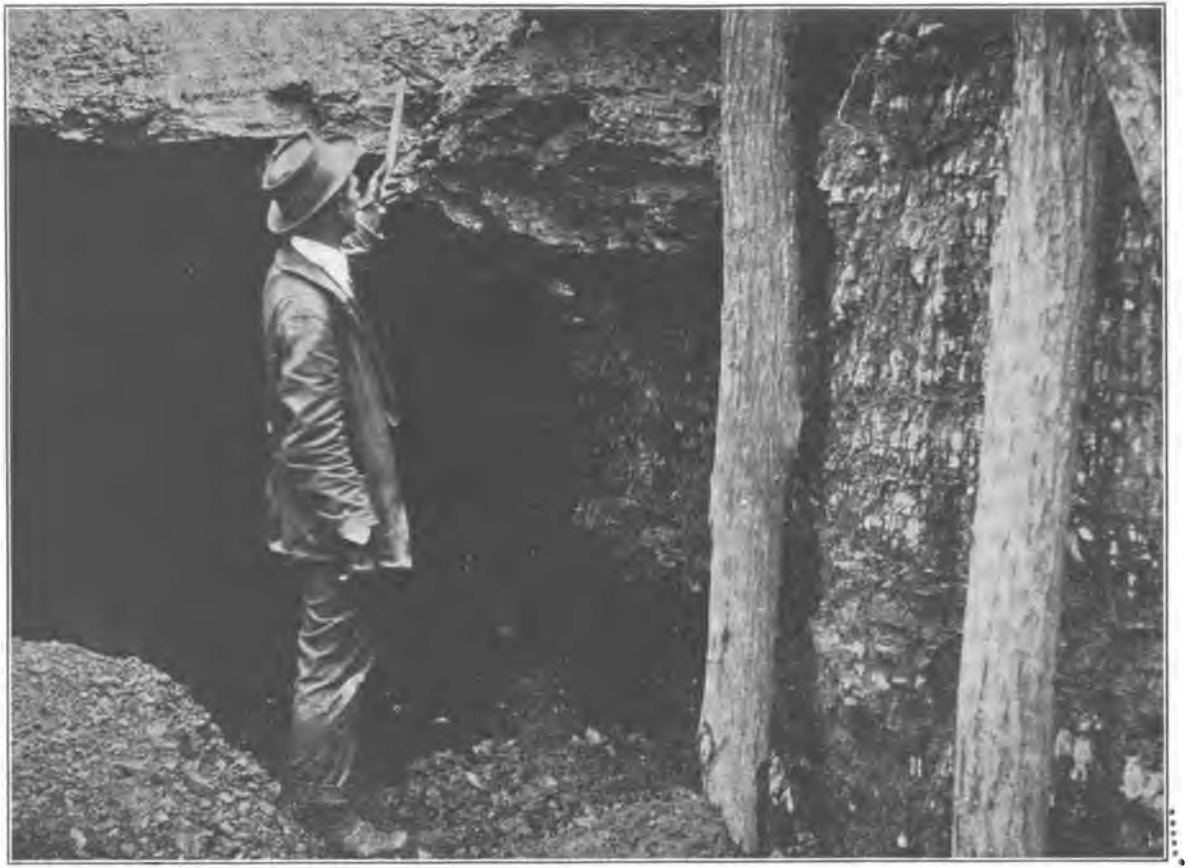

PLATE XXX.—Lower Kittanning Coal at Roscoe King Farm Mine (No. 718 on Map IV), on Tenmile Creek, 1.5 miles east of Tenmile Station. Point of pick is at top of coal.

List of Oil and Gas Wells Recording Upper Freeport Coal

No. on Map.	Name of Well.	Location.	Elevation of well mouth. A. T.	Depth to Coal. Feet.	Thickness. Feet.
	Barbour County:				
9	Julia Hall No. 1	Elk City, 1.5 mi. N. W.	1048L	290	5
	Upshur County:				
41	Isaac S. Reger No. 1	Ruraldale, 2.1 mi. W.	1075B	385	2
47	J. F. Gould Hrs. No. 1	Abbott, 1.5 mi. N.	1220B	122	3
49	Louvina Linger No. 1	Abbott, 1.6 mi. N. E.	1380B	246	8
49A	J. J. Green No. 1	Abbott, 1.3 mi. N.	1450B	270	5
50	John Smith No. 1	Atlas, 2.5 mi. S. W.	1365B	260	5
52	James R. White No. 1	Atlas, 1.4 mi. S. W.	1150L	230	8
53	L. J. Lewis No. 1	Abbott, 1.6 mi. N. E.	1505L	280	3
57	James Duncan No. 1	Abbott, 1.4 mi. N. W.	1365B	268	6
57A	Smith & Green No. 1	Abbott, 1.3 mi. N.	1285B	141	5

Probable Amount of Upper Freeport Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Barbour:					
Pleasant	2	6.35	4,064	354,055,680	14,162,227
Union	3	8.70	5,568	727,626,240	29,105,050
Philippi	1	20.15	12,896	561,749,760	22,469,990
Cove	3	42.35	27,104	3,541,950,720	141,678,029
Glade	3	26.65	17,056	2,228,878,080	89,155,123
Barker	3	25.15	16,096	2,103,425,280	84,137,011
Valley	2	16.60	10,624	925,562,880	37,022,515
Totals		145.95	93,408	10,443,248,640	417,729,945
Upshur:					
Warren	2	8.10	5,184	451,630,080	18,065,203
Buckhannon	3	8.80	5,632	735,989,760	29,439,590
Union	3	19.65	12,576	1,643,431,680	65,737,267
Meade	4	19.45	12,448	2,168,939,520	86,757,581
Washington	3	7.70	4,928	643,991,040	25,759,642
Totals		63.70	40,768	5,643,982,080	225,759,283
Totals for Area		209.65	134,176	16,087,230,720	643,489,228

UPPER KITTANNING COAL.

The Upper Kittanning Coal, previously discussed in Chapter VII, page 251, and shown by outcrop lines on Maps II and IV in those portions of the three counties where it is above drainage and of minable thickness, occurs in considerable quantity in most of the region of its outcrop, as well as being frequently found in coal, oil, and gas borings in some of the localities where its horizon is below drainage. In Barbour, it seems best developed along the Tygart Valley River between the Taylor County Line and Tygart Junction. In Upshur, openings were more plentiful in Union than in any other District. In Randolph, its horizon is found only in the northern part of Roaring Creek District where it has been opened at a few places. The coal varies in thickness from 2 to 5 feet, usually having a parting of slate or bone about one foot from the base. It has been mined commercially on a small scale at one point in Barbour and has been frequently used for domestic fuel at many points along its outcrop. Figure 9 shows its probable areal extent as a minable seam.

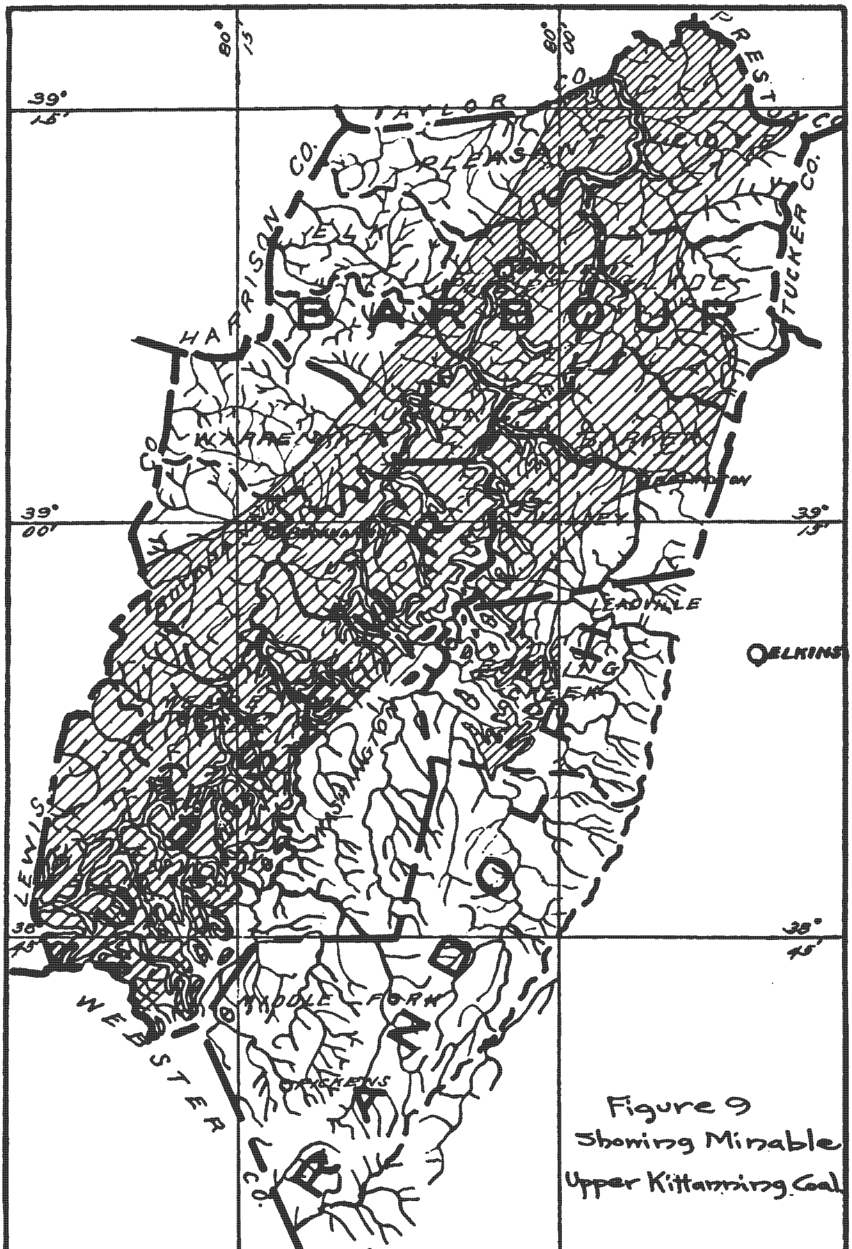

Figure 9
Showing Minable
Upper Kittanning Coal

Scale 1" = 8 Miles

Upper Kittanning Coal, Pleasant District, Barbour.

In Pleasant District, the Upper Kittanning is above drainage at the eastern end along the Tygart Valley River where it was observed at a few points by Teets, as follows:

Della Mitchell Farm Mine—No. 474 on Map II.

On Mitchell Run, 0.8 mile northwest of Arden; Upper Kittanning Coal; elevation, 1300′ B.

			Ft.	In.
Sandstone				
Coal	1′	1″		
Shale, gray	2	2		
Coal	0	8		
Slate	0	1		
Coal	1	9	5	9
Slate, pavement				

Mrs. Wolf Farm Mine—No. 475 on Map II.

On the Tygart Valley River, 0.4 mile northwest of Felton; Upper Kittanning Coal; elevation, 1300′ B.

			Ft.	In.
Sandstone, roof			5	0
Coal	0′	2″		
Shale, gray	0	7		
Coal, soft	2	1		
Shale, gray	0	11		
Coal	0	7	4	4
Slate				

A sample was collected from this opening, the composition of which is published under **Mine No. 475** in the table of coal analyses at the end of this Chapter.

At the **Midland Coal and Coke Company Shaft (No. 476 on Map II)**, the Upper Kittanning Coal was found to be 5′ 8½″ thick, with partings, at an elevation of 1265′ B., the base of the coal being 48 feet below the surface, as exhibited in the section for Berryburg Junction, page 83.

Upper Kittanning Coal, Union District, Barbour

In Union District, a few openings of Upper Kittanning Coal were found by Teets, on the waters of Buckhannon and

Middle Fork Rivers. The **Henry Wentz Farm Mine (No. 477 on Map II)**, located on the Buckhannon River, 1.3 miles southwest of Hall, at an elevation of 1425′ B., had fallen shut and could not be measured.

Albert Knitz Farm Mine—No. 478 on Map II.

On Lick Shoals Run of Buckhannon River, 0.9 mile southeast of Boulder; **Upper Kittanning Coal**; elevation, 1640′ B.

			Ft.	In.
Slate				
Coal, soft	1′	11″		
Slate	0	1		
Coal	1	5		
Slate	0	2		
Coal	0	5	4	0
Slate, pavement				

The **Charles Saffle Farm Mine (No. 479 on Map II)**, located on Middle Fork River, 0.3 mile northwest of Audra, at an elevation of 1825′ B., showed a thickness of 2′ 9″ clean coal. The **Elliott Lantz Farm Mine (No. 480 on Map II)**, located on Middle Fork River, 0.3 mile west of Audra, measured 2′ 1″ of clean coal, at an elevation of 1825′ B.

Upper Kittanning Coal, Philippi District, Barbour.

In Philippi District, the Upper Kittanning Coal has been prospected at numerous points and has been mined on a considerable scale for domestic use, and has been loaded for railroad shipment at one or two places.

Several openings have been made along the Tygart Valley River. The **L. B. Brydon Prospect (No. 481 on Map II)**, located 0.5 mile east of Arden, at an elevation of 1400′ B., and 70 feet by hand-level above the Lower Kittanning, had fallen shut and could not be measured.

Dalton Moore Farm Mine—No. 482 on Map II.

On the Tygart Valley River, 1.4 miles southwest of Arden; **Upper Kittanning Coal**; elevation, 1360′ B.

	Ft.	In.
Sandstone, massive		

Coal	0'	11"		
Shale, gray	0	6		
Coal	0	7		
Slate, bony	0	2		
Coal	1	6	3	8
Slate, pavement				

Henry Felton Farm Mine—No. 483 on Map II.

On the Tygart Valley River, 1.3 miles southwest of Arden; **Upper Kittanning Coal**; elevation, 1305' B.

			Ft.	In.
Sandstone, massive				
Slate, soft			0	3
Coal	0'	7"		
Fire clay, soft	0	4		
Coal	1	7	2	6
Concealed				

Baltimore & Ohio Railroad Prospect—No. 484 on Map II.

On the Tygart Valley River, 0.5 mile north of Meriden; **Upper Kittanning Coal**; elevation, 1310' B.

			Ft.	In.
Sandstone, shaly				
Slate, black, cannel			0	4
Slate, black			0	6
Coal	2'	2"		
Slate, dark, soft	0	1		
Coal	1	8	3	11

At the **Baltimore and Ohio Railroad Coal Exposure (No. 485 on Map II)**, on the Tygart Valley River, 0.3 mile north of Meriden, the coal is visible in the bluff above the grade, at an elevation of 1325' B., and showing a thickness of about 4 feet.

The coal has been operated commercially on a small scale at Meriden where Teets secured the following data:

Lee J. Sandridge Coal Co. Mine (Meriden No. 5)—No. 486 on Map II.

On the Tygart Valley River, at Meriden; **Upper Kittanning Coal**; elevation, 1350' B.

	Ft.	In.
1. Slate		

2.	Coal, hard	2'	4"		
3.	Slate	0	1		
4.	Coal	1	4	3	9
5.	Slate, pavement				

"Principal office, Meriden, W. Va.; coal owned by A. Thompson; daily capacity, 50 tons; 5 men employed; coal shipped East and West for domestic and steam fuel; butts, N. 83° E.; faces, N. 10° W.; greatest rise, southeast; sample collected from Nos. 2 and 4 of section in No. 2 Right, off Main Heading; Lee J. Sandridge, President, authority for mine data."

The composition of this sample is published under **Mine No. 486** in the table of coal analyses at the end of this Chapter.

At the above mine the Upper Kittanning Coal is only 20 feet, by hand-level, above the base of the Lower Kittanning, separated only by the Johnstown Limestone and a few sandy shales.

The following mine is located in the edge of Philippi and supplies a large amount of steam and domestic fuel for the town:

A. J. Nash Farm Mine—No. 487 on Map II.

On the Tygart Valley River, at the western edge of Philippi, Upper Kittanning Coal; elevation, 1310' B.

				Ft.	In.
1.	Sandstone				
2.	Slate, black, cannel			0	3
3.	Coal	2'	8"		
4.	Slate, black, hard	0	1		
5.	Coal	1	5	4	2
6.	Slate, pavement				

A sample was collected from Nos. 3 and 5 of section, the composition of which is published under **Mine No. 487** in the table of coal analyses at the end of this Chapter.

Another opening in the same vicinity shows the following:

Charles F. Teter Heirs Farm Mine—No. 488 on Map II.

On the Tygart Valley River, 0.2 mile southwest of Philippi; Upper Kittanning Coal; elevation, 1320' B.

			Ft.	In.
Sandstone, shaly				
Slate, black, cannel			0	3
Coal	2'	8 "		
Slate, black	0	0½		
Coal	1	6½	4	3
Slate, pavement				

The **W. T. Ice Farm Mine (No. 489 on Map II),** located on the Tygart Valley River, 0.4 mile southwest of Philippi the full section of which is published in connection with the geologic section for Philippi, page 97, measured 5′ 7″, including slate partings. Coal from this mine is hauled into Philippi for local use.

The following opening had fallen shut, the section being reported as follows by John Swick:

John Poling Farm Mine—No. 490 on Map II.

On the Tygart Valley River, 0.8 mile south of Philippi; Upper Kittanning Coal; elevation, 1340′ B.

			Ft.	In.
Slate, black, cannel			0	3
Coal	2′	10″		
Slate	0	2		
Coal	1	0	4	2
Slate, pavement				

The following opening was noted on a creek east of Philippi:

William Boyles Farm Mine—No. 491 on Map II.

On Ford Run, 1.3 miles east of Philippi; Upper Kittanning Coal; elevation, 1610′ B.

			Ft.	In.
Sandstone, massive				
Slate, black, cannelly			0	4
Coal	0′	9″		
Slate, dark, soft	0	1		
Coal	2	4	3	2
Slate, pavement				

The following prospect was partly filled with water, the section being reported by W. S. Brydon, Superintendent of the coal company that owns it. The prospect is 55 feet by hand-level above the base of the Lower Kittanning Coal:

Grafton Fuel Company Prospect—No. 492 on Map II.

On the Tygart Valley River, 0.5 mile north of Lillian; Upper Kittanning Coal; elevation, 1416' L.

			Ft.	In.
Shale, sandy			10	0
Coal	2'	0"		
Slate, black, 0' 0½" to	0	1		
Coal	1	11	4	0

A few openings have been made along Little Laurel Run, reported as follows by Teets:

Frank Daugherty Farm Mine—No. 493 on Map II.

On Little Laurel Run, 1.7 miles east of Lillian; Upper Kittanning Coal; elevation, 1635' B.

			Ft.	In.
Slate, cannel				
Coal	0'	8"		
Shale, sandy	0	3		
Coal, bony	0	6		
Coal, soft	2	0	3	5
Slate, pavement				

A sample was collected from this coal, the composition of which is published under **Mine No. 493** in the table of coal analyses at the end of this Chapter.

Davis Burner Farm Mine—No. 494 on Map II.

On Little Laurel Run, 1.7 miles east of Lillian; Upper Kittanning Coal; elevation, 1635' B.

			Ft.	In.
Slate, black, cannel				
Coal	0'	8"		
Coal, bony	0	8		
Coal, soft	2	1	3	5
Slate, pavement				

Virgil Daugherty Farm Mine—No. 495 on Map II.

On Little Laurel Run, 2.2 miles southeast of Lillian; Upper Kittanning Coal; elevation, 1670' B.

			Ft.	In.
Shale, slaty				
Coal, soft	1'	1"		
Slate, black, cannel	1	10		

			Ft.	In.
Coal	0′	11″		
Shale, gray	0	6		
Coal, bony	0	10		
Coal	1	7	6	9
Slate, pavement				

The coal was noted by Teets at a few points on Big Laurel Run, as follows:

At **Coal Exposure No. 496 on Map II**, located in the public road, 0.7 mile northeast of Mt. Liberty, the coal was 1′ 8″ thick, at an elevation of 1715′ B.

D. M. Boylen Farm Mine—No. 497 on Map II.

On Big Laurel Run, 1 mile northeast of Mt. Liberty; **Upper Kittanning Coal**; elevation, 1765′ B.

			Ft.	In.
Slate				
Coal	0′	1″		
Slate	0	1		
Coal	2	0		
Slate	0	3		
Coal	1	6	3	11
Slate, pavement				

Harmon Fisher Farm Mine—No. 498 on Map II.

On Big Laurel Run, 1.4 miles northeast of Mt. Liberty; **Upper Kittanning Coal**; elevation, 1765′ B.

	Ft.	In.
Sandstone		
Slate	0	2
Coal	1	10
Slate, pavement		

Upper Kittanning Coal, Cove District, Barbour.

In Cove District, a few openings were noted in the Upper Kittanning along Glade Run of Teter Creek, as follows:

L. D. Freeman Farm Mine—No. 499 on Map II.

On Glade Run, 0.9 mile south of Moatsville village; **Upper Kittanning Coal**; elevation, 1480′ B.

			Ft.	In.
Slate, dark			3	0
Coal			0	3
Slate, dark			2	0
Coal, soft	2′	2″		
Slate, bony	0	2		
Coal, bony	1	0	3	4

John Gable Farm Mine—No. 500 on Map II.

On Glade Run, 1.1 miles south of Moatsville village; **Upper Kittanning Coal**; elevation, 1510′ L.

				Ft.	In.
1.	Sandstone, massive				
2.	Slate, black			0	3
3.	Coal, soft	2′	4″		
4.	Slate, dark	0	1		
5.	Coal	1	0	3	5
6.	Slate, pavement				

A sample was collected from Nos. 3 and 5 of section, the composition of which is published under **Mine No. 500** in the table of coal analyses at the end of this Chapter.

Farm Mine No. 501 on Map II, located on Glade Run, 1.7 miles south of Moatsville village, at an elevation of 1545′ B., had fallen shut and could not be measured.

Farm Mine—No. 502 on Map II.

On Glade Run, 2 miles south of Moatsville village; **Upper Kittanning Coal**; elevation, 1560′ B.

			Ft.	In.
Sandstone, massive			5	0
Slate, dark			0	4
Coal	2′	9″		
Slate, bony	0	2		
Coal	0	10	3	9
Slate, pavement				

Upper Kittanning Coal, Glade District, Barbour.

In Glade District, only a few openings have been made in the Upper Kittanning as its horizon is under drainage along the Belington Syncline. The **G. M. Sturm Prospect (No. 503 on Map II)**, located on Laurel Creek, 1.1 miles north of Vannoys Mill, had fallen shut, but the coal was reported 2 to 3 feet thick by Mr. Sturm, its elevation being 1610′ B. Two openings were noted along Sugar Creek, as follows:

William Cross Farm Mine—No. 504 on Map II.

On Sugar Creek, 2 miles northeast of Huffman; Upper Kittanning Coal; elevation, 1935′ B.

			Ft.	In.
Shale, sandy				
Coal	0′	10″		
Slate, gray, hard	0	2		
Coal, soft	2	3	3	3
Slate, pavement				

William Cross Farm Mine—No. 505 on Map II.

On Sugar Creek, 2 miles northeast of Huffman; Upper Kittanning Coal; elevation, 1945′ B.

			Ft.	In.
Shale, sandy				
Coal	1′	0″		
Shale, gray, hard	0	4		
Coal, soft	1	11	3	3
Slate, pavement				

Upper Kittanning Coal, Barker District, Barbour.

In Barker District, a few openings have been made in the Upper Kittanning along the eastern flank of the Belington Syncline, as follows:

Laban Cross Farm Mine—No. 506 on Map II.

On Hunter Fork of Sugar Creek, 1.2 miles northeast of Huffman; Upper Kittanning Coal; elevation, 1650′ B.

			Ft.	In.
Sandstone, massive				
Shale, dark, with coal streaks at base			7	0
Coal	1′	0″		
Slate, gray, hard	0	2		
Coal	1	7	2	9
Slate, pavement, and concealed, to creek			5	0

Joseph Fishwater Farm Mine—No. 507 on Map II.

On a branch of Hunter Fork of Sugar Creek, 1.9 miles southeast of Huffman; Upper Kittanning Coal; elevation, 2050' B.

			Ft.	In.
Slate, dark				
Coal	0'	10"		
Slate, gray, hard	0	4		
Coal	2	4	3	6
Slate, pavement				

Farm Mine No. 508 on Map II, located on a branch of Mill Creek, 1.8 miles northeast of Belington, had fallen shut and could not be measured, its elevation being 1775' B.

William Parsons Farm Mine—No. 509 on Map II.

On a branch of Mill Creek, 2 miles northeast of Belington; Upper Kittanning Coal; elevation, 1880' B.

			Ft.	In.
Sandstone, massive			10	0
Coal	0'	11"		
Slate, black, hard	0	3		
Coal	1	10	3	0
Slate, pavement				

Upper Kittanning Coal, Union District, Upshur.

In Union District, numerous openings have been made in the Upper Kittanning Coal, showing a thickness of 2 to 4 feet. The following mines were noted by Teets in his examination of this region:

The **David M. Wentz Farm Mine (No. 510 on Map IV),** located on Island Run, 1.2 miles southeast of Hall, at an elevation of 1640' B., showed a thickness of about 2 feet, the roof being a massive sandstone.

A few openings have been made along Handy Camp Run. The two following mines had fallen shut, the sections being reported as follows:

D. G. Harris Farm Mine—No. 511 on Map IV.

On Handy Camp Run, 0.8 mile east of Wentz Ford; **Upper Kittanning Coal**; elevation, 1655′ B.

			Ft.	In.
Sandstone, roof				
Coal	1′	0″		
Slate	0	1		
Coal	1	9	2	10
Slate				

Anthony Booth Farm Mine—No. 512 on Map IV.

On Handy Camp Run, 1.2 miles east of Wentz Ford; **Upper Kittanning Coal**; elevation, 1710′ B.

			Ft.	In.
Sandstone, roof				
Coal	1′	0″		
Slate	0	1		
Coal	1	10	2	11
Slate, pavement				

Several openings have been made along the waters of Sand Run. **Coal Exposure No. 513 on Map IV,** located on a branch of Little Laurel Fork, 0.9 mile northwest of Vegan, showed 1′ 2″ of coal in the county road, at an elevation of 1800′ B.

Stephen Hinzman Farm Mine—No. 514 on Map IV.

On a branch of Laurel Fork of Sand Run, at Vegan; **Upper Kittanning Coal**; elevation, 1935′ B.

			Ft.	In.
Shale, dark, visible			4	0
Coal	1′	9 ″		
Slate, gray	0	0½		
Coal	1	10½	3	8
Slate, pavement				

The **John Kesling Farm Mine—No. 515 on Map IV,** located on a branch of Sand Run, 0.7 mile southeast of Hinkle, showed a thickness of 2′ 3″, the elevation being 1660′ B. **Farm Mine No. 516 on Map IV,** located on Middle Fork of Laurel Fork, 1.3 miles southeast of Hinkle, at an elevation of 1735′ B., showed a thickness of 3′ 4″, clean coal.

G. Hinkle Farm Mine—No. 517 on Map IV.

On Laurel Fork of Sand Run, 0.6 mile north of Vegan; Upper Kittanning Coal; elevation, 1920′ B.

			Ft.	In.
Slate				
Coal	1′	7″		
Coal, bony	0	6		
Coal	1	6	3	7
Slate, pavement				

The following opening had fallen shut, its section being reported by residents:

Joshua Lantz Farm Mine—No. 518 on Map IV.

On Laurel Fork of Sand Run, 1.9 miles west of Yokum; Upper Kittanning Coal; elevation, 2017′ L.

			Ft.	In.
Sandstone				
Coal	1′	1″		
Slate	0	3		
Coal	0	2		
Slate	0	2		
Coal	1	3	2	11
Slate, pavement				

James Burke Farm Mine—No. 519 on Map IV.

On Laurel Fork of Sand Run, 0.4 mile northeast of Vegan; Upper Kittanning Coal; elevation, 1975′ B.

			Ft.	In.
Slate, roof				
Coal, soft	1′	6″		
Coal, bony	0	6		
Coal, soft	1	7	3	7
Slate, pavement				

Peter Burke Farm Mine—No. 520 on Map IV.

On Laurel Fork of Sand Run, 0.8 mile southeast of Vegan; Upper Kittanning Coal; elevation, 2050′ B.

			Ft.	In.
Sandstone, roof				
Coal, soft	1′	5″		
Coal, bony	0	9		
Coal, hard	1	0	3	2
Slate, pavement				

Nathan Cochran Farm Mine—No. 521 on Map IV.

On Laurel Fork of Sand Run, 0.8 mile northwest of Lantz; Upper Kittanning Coal; elevation, 2075′ B.

			Ft.	In.
Sandstone, roof				
Coal	1′	0″		
Slate	0	1		
Coal	2	1	3	2
Slate, pavement				

Harley Dean Farm Mine—No. 522 on Map IV.

On Sand Run, 0.7 mile southwest of Hinkle; Upper Kittanning Coal; elevation, 1468′ L.

			Ft.	In.
Sandstone, massive			6	0
Shale and slate			0	8
Coal	0′	9″		
Slate, black	0	1		
Coal	1	6		
Shale, gray	0	8		
Coal	0	2	3	2
Slate				

Martin Dolan Farm Mine—No. 523 on Map IV.

On Sand Run, 1.5 miles north of Overhill; Upper Kittanning Coal; elevation, 1520′ B.

			Ft.	In.
Sandstone, massive, visible			3	0
Shale, slaty			0	6
Coal	0′	11″		
Slate, gray	0	1		
Coal	1	6	2	6
Slate, pavement				

Martin Dolan Farm Mine—No. 524 on Map IV.

On Sand Run, 1.4 miles north of Overhill; Upper Kittanning Coal; elevation, 1512′ L.

			Ft.	In.
Sandstone, massive, fine-grained			5	0
Shale, slaty			0	6
Coal	0′	10″		
Slate, gray	0	1		
Coal	1	7	2	6
Slate, pavement				

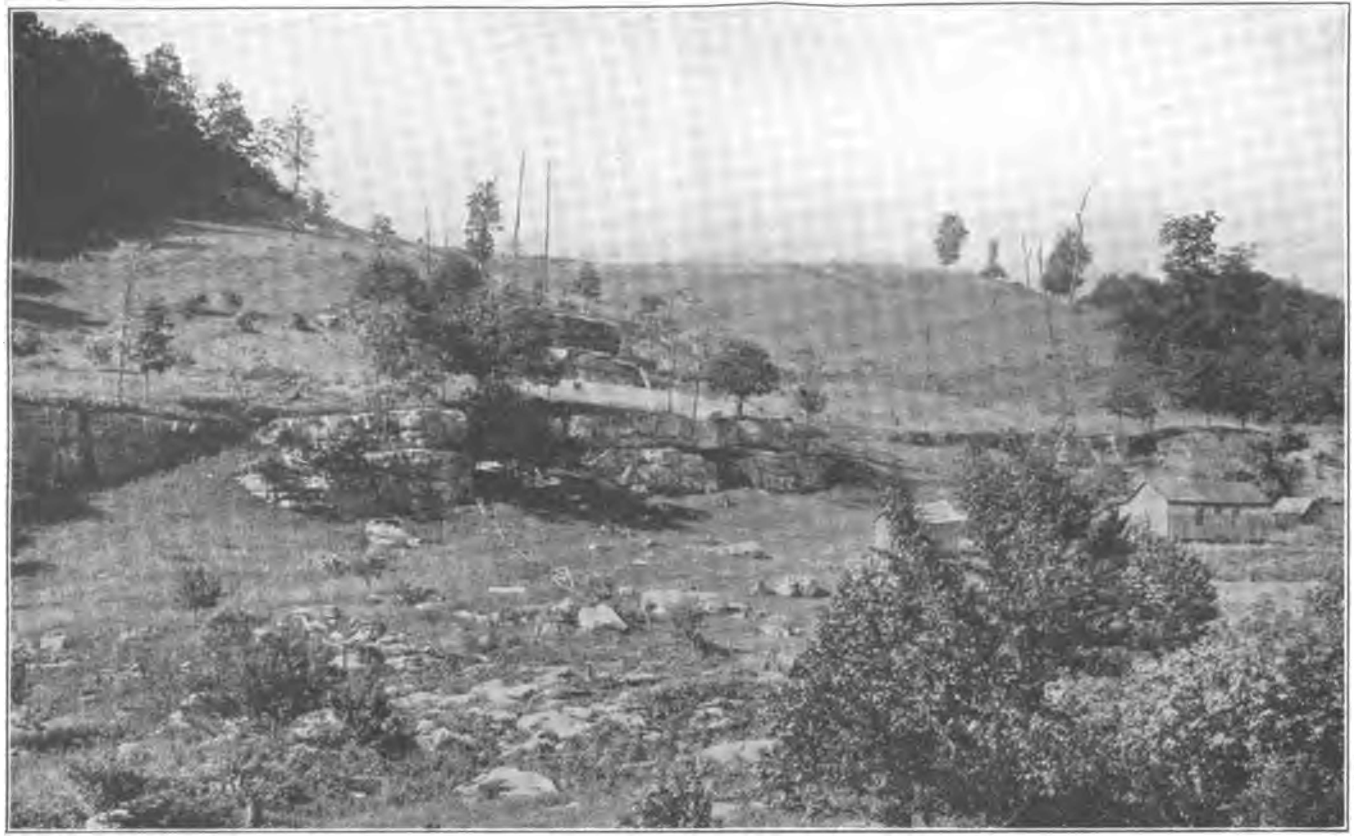

PLATE XXXI.—East Lynn Sandstone (upper cliff), Lower Kittanning Coal (left of center), and Homewood Sandstone (lower cliff), on Tenmile Creek, 1.5 miles east of Tenmile Station, Upshur County; Topography of Allegheny and Pottsville Series.

R. J. Crosby Farm Mine—No. 525 on Map IV.

On Left Fork of Sand Run, 0.6 mile northeast of Overhill; **Upper Kittanning Coal**; elevation, 1640′ B.

			Ft.	In.
Sandstone, roof				
Coal, soft	1′	10″		
Slate	0	1		
Coal, soft	1	0	2	11
Slate, pavement				

E. A. Hinzman Farm Mine—No. 526 on Map IV.

On a branch of Left Fork of Sand Run, 0.7 mile southeast of Vegan; **Upper Kittanning Coal**; elevation, 2040′ B.

			Ft.	In.
Sandstone, roof				
Coal, soft	1′	1″		
Slate, black	0	1		
Coal, soft	2	3	3	5
Slate, pavement				

Several openings have been made along the waters of Middle Fork River, next to the Randolph and Barbour Lines. The **W. P. Zirkle Farm Mine (No. 527 on Map IV),** located 1.5 miles southeast of Swamp Run village, at an elevation of 2090′ B., had fallen shut, but the coal was reported 1′ 8″ thick. The **Jerome Morrison Farm Mine (No. 528 on Map IV),** located on Hooppole Run, 1.4 miles northwest of Yokum, had an estimated thickness of 2′ 6″, the elevation being 2060′ B. **Farm Mine No. 529 on Map IV,** located on the ridge west of Middle Fork River, and 0.6 mile west of Lantz, at an elevation of 2130′ B., had fallen shut and could not be measured, the coal having been mined by stripping.

Farm Mine—No. 530 on Map IV.

On a branch of Whiteoak Run of Middle Fork River, 0.9 mile west of Lantz; **Upper Kittanning Coal**; elevation, 2085′ B.

			Ft.	In.
Sandstone, massive, visible			3	0
Slate, black			1	8
Coal, medium-hard	2′	1″		
Coal, bony	0	4		
Coal, soft	1	3	3	8
Slate, pavement				

Upper Kittanning Coal, Meade District, Upshur.

In Meade District, only a few exposures of Upper Kittanning Coal were found, showing in most cases that it is of doubtful value. The **Coal and Coke Railway Exposure (No. 531 on Map IV),** located at the east portal of the Sago tunnel, 0.7 mile southeast of Sago, showed 2′ 8″ of coal and slate, at an elevation of 1525′ B., as given in detail in the section for Sago, page 134. The **Coal and Coke Railway Exposure (No. 532 on Map IV),** located on French Creek, 1.2 miles east of Adrian, showed about 1 foot of coal at an elevation of 1435′ B. The coal was once opened at **Prospect No. 533 on Map IV,** on a branch of Buckhannon River, 0.4 mile southeast of Ours Mill, at an elevation of 1690′ B., but the place had fallen shut and could not be measured. It was also opened at **Prospect No. 534 on Map IV,** on Grandcamp Run, 1.6 miles southwest of Ours Mill, at an elevation of 1695′ B., but this place also had fallen shut, little coal, apparently, being found.

Upper Kittanning Coal, Washington District, Upshur.

In Washington District, only a few openings were noted in the Upper Kittanning, and these do not show coal of much value. The two following openings, examined by Teets, were found along Trubie Run:

Creed Shipman Farm Mine—No. 535 on Map IV.

On Trubie Run, 1.3 miles northwest of Tallmansville; Upper Kittanning Coal; elevation, 1585′ B.

			Ft.	In.
Shale, sandy, roof				
Coal, soft	0′	10″		
Coal, slaty	0	1		
Coal, soft	1	10	2	9
Slate, pavement				

The **William Smith Farm Mine (No. 536 on Map IV),** located 1.1 miles west of Tallmansville, at an elevation of 1620′ B., had an estimated thickness of 2 feet, evidently being partly closed so that a measurement could not be made.

A few exposures were noted along the railroad cuts on Grassy Run. The **Coal and Coke Railway Exposure—No. 537 on Map IV,** 0.3 mile west of Tallmansville, showed 1 foot of slaty coal, at elevation of 1690′ B.

Coal and Coke Railway Exposure—No. 538 on Map IV.

On Grassy Run, at Tallmansville; Upper Kittanning Coal; elevation, 1700′ B.

			Ft.	In.
Sandstone, massive, Lower Freeport			15	0
Coal	2′	0″		
Slate, dark	0	2		
Coal	1	6	3	8
Shale, gray			5	0
Shale, sandy, to grade			15	0

Coal and Coke Railway Exposure—No. 539 on Map IV.

On Grassy Run, 0.3 mile northeast of Tallmansville; Upper Kittanning Coal; elevation, 1710′ B.

			Ft.	In.
Sandstone, massive			10	0
Coal	1′	6″		
Slate, dark	0	1		
Coal	1	6	3	1
Fire clay shale, to grade			5	0

Upper Kittanning Coal, Banks District, Upshur.

In Banks District, a few openings have been made in the Upper Kittanning along the waters of the Little Kanawha River, showing 2 to 4 feet of good coal. The **Charles Rexroad Mine (No. 540 on Map IV),** located on Cherry Fork, 1.5 miles northeast of Ingo, at an elevation of 1620′ B., had fallen shut, but was reported as being 3 feet thick. The coal has once been opened at **Farm Mine No. 541 on Map IV,** on a branch of Cherry Fork, 2.6 miles north of Ingo, at an elevation of 1435′ B., but the place is now abandoned, its thickness being unknown.

Floyd Mick Farm Mine—No. 542 on Map IV.

On Cherry Fork, 2.5 miles northeast of Ingo; Upper Kittanning Coal; elevation, 1645′ B.

			Ft.	In.
Slate				
Coal	2′	3″		
Slate, bony	0	4		
Coal	2	2	4	9
Slate, pavement				

Coal Exposure No. 543 on Map IV, located on Panther Fork, 1.7 miles northeast of Ingo, showed 1 foot of slaty coal, at an elevation of 1695′ B.

Emory Riffle Farm Mine—No. 544 on Map IV.

On Cow Run, 1.6 miles northwest of Arlington; Upper Kittanning Coal; elevation, 1640′ B.

			Ft.	In.
Sandstone, massive				
Coal, slaty	1′	3″		
Bone	0	1		
Coal, soft	1	10	3	2
Slate, pavement, and concealed:			5	0
Sandstone, massive			10	0

At **Farm Mine No. 545 on Map IV,** located on Kanawha Run, 0.7 mile northeast of Stillman, the coal has been stripped from the run, at an elevation of 1650′ B., showing 2 feet of slaty coal. The coal was once opened at **Farm Mine No. 546 on Map IV,** on Laurel Run, 1 mile north of Canaan, at an elevation of 2230′ B., but apparently not much was found. The **John Beverage Farm Mine (No. 547 on Map IV),** located on the Right Fork, 0.6 mile north of Cleveland, showed 3′ 7″ of coal and slate, at an elevation of 1780′ L., as given in detail in the Cleveland Section, page 153.

Upper Kittanning Coal, Roaring Creek District, Randolph.

In the northern end of Roaring Creek District, a few exposures of the Upper Kittanning were noted but it has not been generally opened in the region of its crop. At **Coal Exposure No. 548 on Map IV,** on the head of Big Laurel Run of Tygart Valley, 0.3 mile **southeast of Kingsville,** the coal exposed in the public road at an elevation of 2405′ B., showing a heavy blossom, 6 to 7 feet thick. The following opening apparently represents the Upper Kittanning as it comes 40 feet above the Lower Kittanning, but differs radically from the bed-section usually found:

Mike King Farm Mine—No. 549 on Map IV.

On Big Laurel Run of Tygart Valley, 1.3 miles northeast of Pumpkintown; Upper Kittanning Coal; elevation, 2320′ B.

			Ft.	In.
Slate, dark				
Coal, soft	1′	9″		
Shale, gray	1	6		
Coal, soft	1	2		
Slate, black	0	2		
Coal	0	3		
Slate, black, bony	0	10		
Coal, soft	2	0		
Slate, reported	0	8		
Coal, reported	2	0	10	4

Quantity of Upper Kittanning Coal Available.

In addition to the coal openings described on the preceding pages, the accompanying table shows a list of oil and gas wells that record Upper Kittanning Coal in the regions where its horizon is under drainage. Another table is added showing the probable amount of this coal by magisterial districts, the areal extent of which was measured with planimeter by R. C. Tucker according to the surface and underground areas outlined for it on Maps II and IV and Figure 9.

List of Oil and Gas Wells Recording Upper Kittanning Coal.

No. on Map	Name of Well.	Location.	Elevation of Well Mouth. A. T.	Depth to Coal. Feet.	Thickness. Feet.
	Barbour County:				
9	Julia Hall No. 1..........	Elk City, 1.5 mi. N. W.	1048L	400	3
17	E. D. Talbott Heirs No. 2.	Philippi, 0.5 mi. W.....	1414L	180	3
	Upshur County:				
51	Jacob Krise No. 1........	Atlas, 2.3 mi. S. W.....	1255B	385	5
52	James R. White No. 1....	Atlas, 1.4 mi. S. W.....	1150L	305	5

Probable Amount of Upper Kittanning Coal.

Counties by Districts	Thickness of Coal. Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Barbour:					
Pleasant	3	16.10	10,304	1,346,526,720	53,861,069
Union	2	17.80	11,392	992,471,040	39,698,842
Philippi	3	39.50	25,280	3,303,590,400	132,143,616
Cove	3	38.90	24,896	3,253,409,280	130,136,371
Glade	3	25.75	16,480	2,153,606,400	86,144,256
Barker	3	25.15	16,096	2,103,425,280	84,137,011
Valley	3	21.40	13,696	1,789,793,280	71,591,731
Totals..........	..	184.60	118,144	14,942,822,400	597,712,896
Upshur:					
Warren	2	8.35	5,344	465,569,280	18,622,771
Buckhannon	2	22.95	14,688	1,279,618,560	51,184,742
Union	2	34.50	22,080	1,923,609,600	76,944,384
Meade	2	44.35	28,384	2,472,814,080	98,912,563
Washington	2	16.50	10,560	919,987,200	36,799,488
Banks	3	41.50	26,560	3,470,860,800	138,834,432
Totals..........	..	168.15	107,616	10,532,459,520	421,298,380
Randolph:					
Roaring Creek......	3	7.95	5,088	664,899,840	26,595,994
Totals for Area......	..	360.70	230,848	26,140,181,760	1,045,607,270

MIDDLE AND LOWER KITTANNING COALS.

Middle and Lower Kittanning Coal covers a greater acreage and will furnish more fuel than any other seam in the three counties. It has been previously discussed in Chapter VII, pages 261-261, and its outcrop is shown on Maps II and IV. It has been used also as the basis for the red structure contours of the southeastern two-thirds of the area covered by this Report. It is usually of minable thickness where it occurs above drainage and it is also found in some of the oil and gas well borings that have been made in western Barbour and northern Upshur where its horizon lies under water-level, but it is not likely that extensive areas of commercial coal will be found in this region, as its westward thinning makes it patchy and uncertain. It is nearly always a multiple-bedded seam, with two or three streaks of slate or bone. The benches of good coal are clean, bright, soft, and columnar, being easily mined, the thickness of the entire seam varying from 2 to 12 feet. It has been mined commercially on an extensive scale in both Barbour and Randolph and has been opened at numerous points in southern Upshur for local domestic use, being usually low enough in sulphur and phosphorus to make it a fine coking coal.

The Middle Kittanning Coal is a split off the main Lower Kittanning seam, the interval between the two varying from 1 to 40 feet in those portions of southern Barbour, northwestern Randolph, and eastern Upshur where they occur as separate beds. Both seams are often mined in the same opening as one large bed, while at other points they must be handled as separate coals. The Middle Kittanning is of the same type as the Lower Kittanning, being a soft, columnar coal, and frequently having a considerable parting of bony coal or slate. The close association of the two seams makes it obviously impossible to describe them as separate beds and they are therefore presented together, the names "Middle Kittanning" or "Lower Kittanning" being used wherever it is possible to show the openings separately, while they are often noted under the double title. Figure 10 shows their probable areal exten as minable coal.

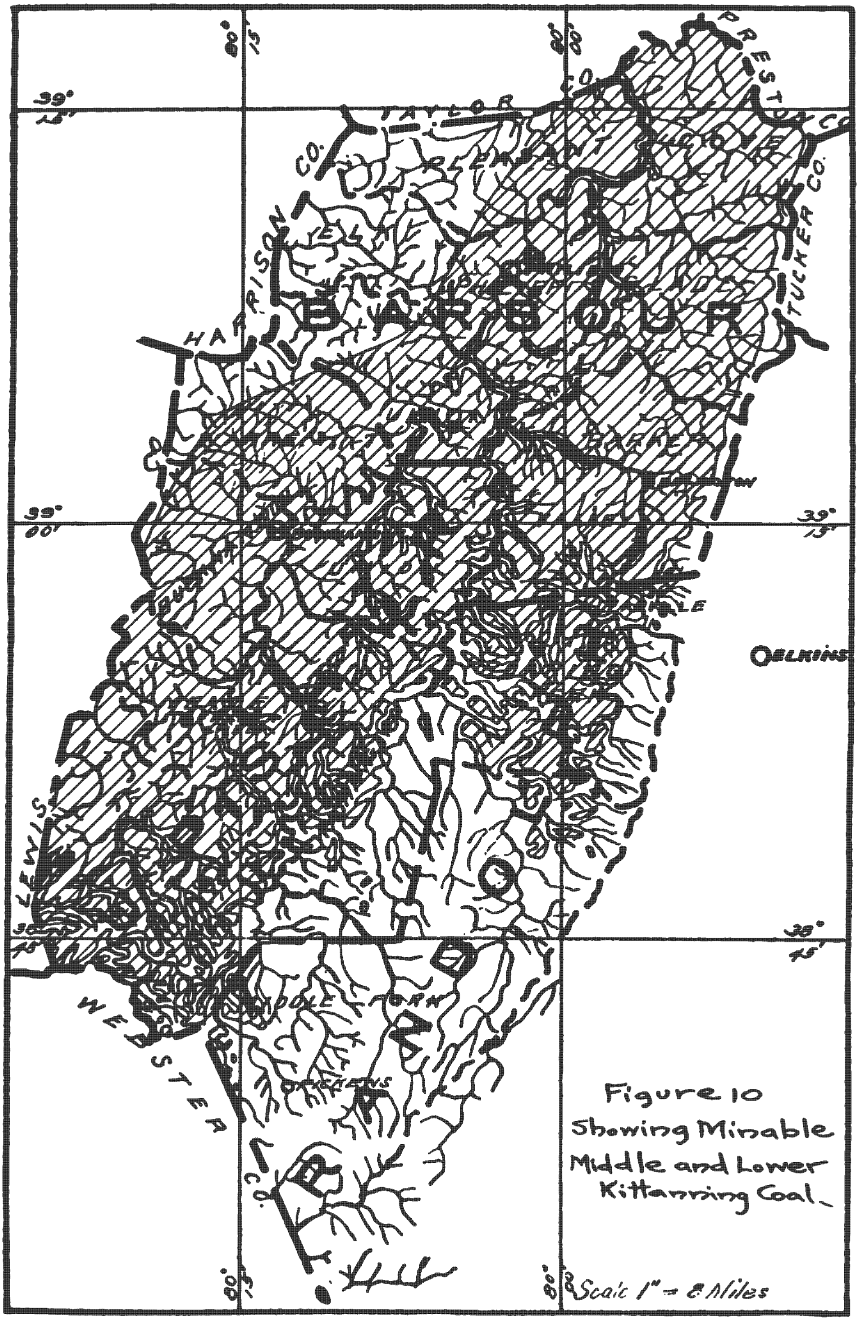

Figure 10
Showing Minable
Middle and Lower
Kittanning Coal.

Middle and Lower Kittanning Coals, Pleasant District, Barbour.

The Lower Kittanning Coal is found above drainage at the eastern edge of Pleasant District along the Tygart Valley River, the Middle Kittanning member apparently being not represented as a separate bed. The coal was noted at several points by Teets, as follows:

George Mayle Farm Mine—No. 550 on Map II.

On the Tygart Valley River, 0.8 mile southeast of Cecil; Lower Kittanning Coal; elevation, 1160′ B.

			Ft.	In.
Slate				
Coal	2′	3″		
Slate	0	8		
Coal	2	3	5	1

Susan Mayle Farm Mine—No. 551 on Map II.

On the Tygart Valley River, 1.1 miles southeast of Cecil; Lower Kittanning Coal; elevation, 1190′ B.

			Ft.	In.
Slate				
Coal, soft	2′	4″		
Slate	0	9		
Coal, harder	2	3	5	4

Mrs. George Ball Farm Mine—No. 552 on Map II.

On Cunningham Run, 0.5 mile northwest of Moatsville Station; Lower Kittanning Coal; elevation, 1270′ B.

			Ft.	In.
Slate and shale			1	0
Sandstone			6	0
Slate, black			2	0
Coal, soft	2′	11″		
Shale, gray	1	0		
Coal, visible	0	6	4	5

Addie Murphy Farm Mine—No. 553 on Map II.

On the Tygart Valley River, 0.8 mile northeast of Arden; Lower Kittanning Coal; elevation, 1370' B.

			Ft.	In.
Slate and concealed				
Coal	1'	11"		
Slate	0	11		
Coal	2	6	5	4
Slate				

Cordelia Mitchell Farm Mine—No. 554 on Map II.

On a branch of Tygart Valley River, 0.2 mile west of Arden; Lower Kittanning Coal; elevation, 1295' B.

			Ft.	In.
Slate				
Coal, soft	2'	3"		
Coal, bony	0	6		
Coal, soft	2	10	5	7
Slate				

The Lower Kittanning Coal was once mined by shaft on the west side of the river north of Berryburg Junction, but this mine has been abandoned for several years, owing to a reported inflow of water from the river. This mine was visited by Ray V. Hennen while still in operation, and the following information secured, as published in Volume II(A), page 515, of the Survey:

Midland Coal and Coke Company Mine—No. 555 on Map II.

On the Tygart Valley River, 0.6 northeast of Berryburg Junction; Lower Kittanning Coal; elevation, 1205' B.

				Ft.	In.
1.	Sandstone, hard			27	0
2.	Coal, with partings, Upper Kittanning			5	8
3.	Sandstone, white, very hard, East Lynn			40	0
4.	Slate, good roof			3	0
5.	Coal, soft	2'	0"		
6.	Coal, bony	0	7		
7.	Coal, soft	0	9		
8.	Bone	0	0¼		
9.	Coal, soft	2	0	5	4¼

"Greatest rise, southeast; mine capacity, 200 tons; men employed, 32; coal shipped mostly East for coke and steam purposes; authority for mine data, Geo. W. Dawson, Mine Foreman; sample for analysis from Nos. 5, 7, 8, and 9 of section."

The composition of this sample is published under **Mine No. 555** in the table of coal analyses at the end of this Chapter. This company also built 100 beehive ovens, 60 of which were in service at the time of Mr. Hennen's visit in June, 1907. A sample of the 48-hour product gave the following results, according to Hite and Patton:

	Per cent.
Moisture	0.95
Volatile Matter	2.55
Fixed Carbon	79.34
Ash	17.26
Sulphur	1.48
Phosphorus	0.022

Concerning this analysis Dr. White makes the following statement at the reference noted above:

> "The ash is too high in this sample, and doubtless much greater than in the average of the coke that it is possible to make from this coal by proper care in separating the bone from the purer coal."

Lower Kittanning Coal, Union District, Barbour.

The coal is not above drainage in **Elk District**, and its value there is problematical, but in **Union** it has been opened at several points near the Tygart Valley and Buckhannon Rivers, as the following will show:

Farm Mine No. 556 on Map II, located on a branch of Tygart Valley River, 0.9 mile south of Carrolton, at an elevation of 1490' B., was abandoned at the time of Teets' visit, but the coal was reported as being 4 to 5 feet thick.

Some openings were examined by Teets along Cottrill Run of Buckhannon River. The **J. L. Teter Farm Mine (No. 557 on Map II)**, located 0.4 mile north of Boulder, at an elevation of 1410' B., had fallen shut and could not be measured.

D. P. Bennett Farm Mine—No. 558 on Map II.

On Cottrill Run, 0.5 mile northeast of Boulder; Lower Kittanning Coal; elevation, 1460' B.

	Ft.	In.
Sandstone, massive, roof		
Conglomerate with pebbles and iron nodules	0	6

Coal	0'	5"		
Slate	0	4		
Coal	1	6		
Slate	0	6		
Coal, hard	1	8	4	5
Slate, floor				

William M. Strader Farm Mine—No. 559 on Map II.

On Cottrill Run, 1.1 miles east of Boulder; Lower Kittanning Coal; elevation, 1580' B.

			Ft.	In.
Sandstone				
Coal, soft	0'	6"		
Slate	0	4		
Coal, soft	1	6		
Slate, dark	0	6		
Coal, hard	1	6	4	4
Slate, pavement				

The coal has been opened at Boulder where it shows the following:

Samuel Simpson Farm Mine—No. 560 on Map II.

On the east side of Tygart Valley River, at Boulder; Lower Kittanning Coal; elevation, 1410' B.

			Ft.	In.
Slate, black				
Coal	0'	6"		
Slate, black	0	2		
Coal, hard	0	5		
Coal, soft	1	3		
Slate, bony	0	9		
Coal, bony	1	9	4	10
Slate, pavement				

The coal was noted by Teets at two points on Lick Shoals Run. At **Coal Exposure No. 561 on Map II,** 0.9 mile southeast of Boulder, the coal was found in the public road. showing a thickness of about 3 feet, at an elevation of 1550' B The **Pat Cain Opening (No. 562 on Map II),** located 1.2 miles southeast of Boulder, at an elevation of 1531' L., had fallen shut and could not be measured.

The coal is just above drainage at the bend of the river at Hall village, where Teets observed the following:

J. P. Newcomb Farm Mine—No. 563 on Map II.

On Buckhannon River, at Hall; **Lower Kittanning Coal**; elevation, 1390′ B.

			Ft.	In.
Sandstone, massive, pebbly, hard, visible			10	0
Coal, block	2′	0″		
Slate, gray	1	0		
Coal, soft, visible	1	11	4	11

The following opening was observed by Teets along the Tygart Valley:

Susan C. Lantz Farm Mine—No. 564 on Map II.

On the Tygart Valley River, 1.1 miles southeast of Tygart Junction; **Lower Kittanning Coal**; elevation, 1540′ B.

			Ft.	In.
Sandstone, massive, gray, pebbly, roof				
Coal, soft	1′	4″		
Shale, gray	1	10		
Coal, soft	1	6	4	8
Slate, pavement				

The **Baltimore and Ohio Railroad Company Farm Mine (No. 565 on Map II)**, located on the Middle Fork River, 0.3 mile southwest of Audra, at an elevation of 1770′ B., showed a total thickness of 6′ 2″, with partings, as given in detail in the section for Audra, page 95.

Lower Kittanning Coal, Philippi District, Barbour.

In Philippi District, the Lower Kittanning Coal has been mined extensively both for domestic use and for railroad shipment, its principal line of crop being along the Tygart Valley River. Several openings have been made along Laurel Creek. the following being noted within the bounds of the District:

Moses Kirby Farm Mine—No. 566 on Map II.

On Laurel Creek, 0.6 mile east of Arden; **Lower Kittanning Coal**; elevation, 1355′ B.

			Ft.	In.
Slate, dark				
Coal	2′	2″		
Coal, bony	0	8		

Coal	2′	6″	5	4
Slate, pavement				

Grant Street Farm Mine—No. 567 on Map II.

On Laurel Creek, 0.6 mile southeast of Arden; **Lower Kittanning Coal**; elevation, 1380′ B.

			Ft.	In.
Sandstone			5	0
Coal	2′	6″		
Coal, bony	0	6		
Coal, soft	2	4	5	4
Slate, pavement				

Isam Stemple Farm Mine—No. 568 on Map II.

On Frost Run of Laurel Creek, 2.1 miles south of Arden; **Lower Kittanning Coal**; elevation, 1510′ B.

			Ft.	In.
Slate, black				
Coal, soft	0′	9″		
Coal, hard, bony	1	0		
Coal, soft	1	10	3	7
Slate, pavement				

James Mayle Farm Mine—No. 569 on Map II.

On a branch of Laurel Creek, 2 miles northwest of Tacy; **Lower Kittanning Coal**; elevation, 1535′ B.

			Ft.	In.
Slate, dark				
Coal	0′	4″		
Shale, gray	0	6		
Coal, soft	2	6	3	4
Slate, pavement				

Earl Miller Farm Mine—No. 570 on Map II.

On a branch of Laurel Creek, 1.5 miles west of Tacy; **Lower Kittanning Coal**; elevation, 1525′ B.

			Ft.	In.
Slate, black, with **Lingulae** fossils			5	0
Coal	2′	10″		
Shale, gray	0	8		
Coal	1	4	4	10
Slate, pavement				

The presence of marine fossils in the roof shales of the Lower Kittanning Coal is unusual, no other instance being known to the writer.

Numerous openings have been made along the Tygart Valley River, both for railroad shipment and domestic fuel. The following mine, examined by A. P. Brady, and previously described by Dr. White in Volume II(A), page 506, has now been abandoned and dismantled, most of the coal being evidently mined out:

Laurel Coal Company Mine—No. 571 on Map II.

On the Tygart Valley River, 0.6 mile northeast of Arden; Lower Kittanning Coal; elevation, 1330′ B.; butts, S. 78° E.; faces, S. 12° W.

			Ft.	In.
Sandstone				
Slate				
Draw slate				
Coal	2′	8″		
Bone coal	0	7		
Coal	2	6	5	9

A sample was collected, presumably from the upper and lower benches of good coal, the composition of which is given under **Mine No. 571** in the table of coal analyses at the end of this Chapter.

The following mine, formerly known as the Tygarts Valley Coal and Coke Company, operates the coal at Arden:

Boat Run Coal Company Mine—No. 572 on Map II.

On the Tygart Valley River, at Arden; Lower Kittanning Coal; elevation, 1330′ L.

			Ft.	In.
Slate				
Coal, soft	2′	5½″		
Coal, bony	0	7½		
Coal, soft, columnar	2	9	5	10
Slate, pavement				

"Principal office, Grafton; daily capacity and output, 400 tons; 45 miners and 10 laborers employed; coal shipped East for railroad fuel; butts, S. 78° E.; faces, S. 12° W.; greatest rise, southeast; Ira Hoffman, Superintendent, authority for mine data."

A sample collected from the above mine by A. P. Brady, and previously reported in Volume II(A), pages 506-507, is given under **Mine No. 572** in the table of coal analyses at the end of this Chapter.

Luella Coal and Coke Company Mine—No. 573 on Map II.

On the Tygart Valley River, 0.5 mile south of Arden; Lower Kittanning Coal; elevation, 1345' B.

			Ft.	In.
1.	Slate roof (sometimes sandstone)..........			
2.	Coal, hard........................	2' 8"		
3.	Bone	0 7		
4.	Coal, fine......................	2 8½	5	11½
5.	Slate, pavement..........................			

"Principal office, Philippi; daily capacity and output, 300 tons; 40 miners and 10 laborers employed; mule haulage; coal shipped East and West for domestic and steam fuel; butts, N. 83° E.; faces, N. 7° W.; greatest rise, southeast, sample collected from Nos. 2 and 4 of section in Room No. 1, off First Right Heading by D. D. Teets, Jr.; H. M. Crawford, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 573** in the table of coal analyses at the end of this Chapter.

An extensive mining operation has been carried on for many years at Meriden, where both the Upper and Lower Kittanning Coals are mined and handled from the same tipple. The opening in the Upper Kittanning has been previously described under **Mine No. 486**, page 534. These operations have also been described in Volume II, page 427, under the name of the Philippi Coal and Mining Company, and in Volume II(A), page 507, under the same title. Since the publication of those reports, the title of the company has been changed as will appear below; the names of Hall Coal Company, and Meriden Coal Mining Company, having been applied to the plant during its history:

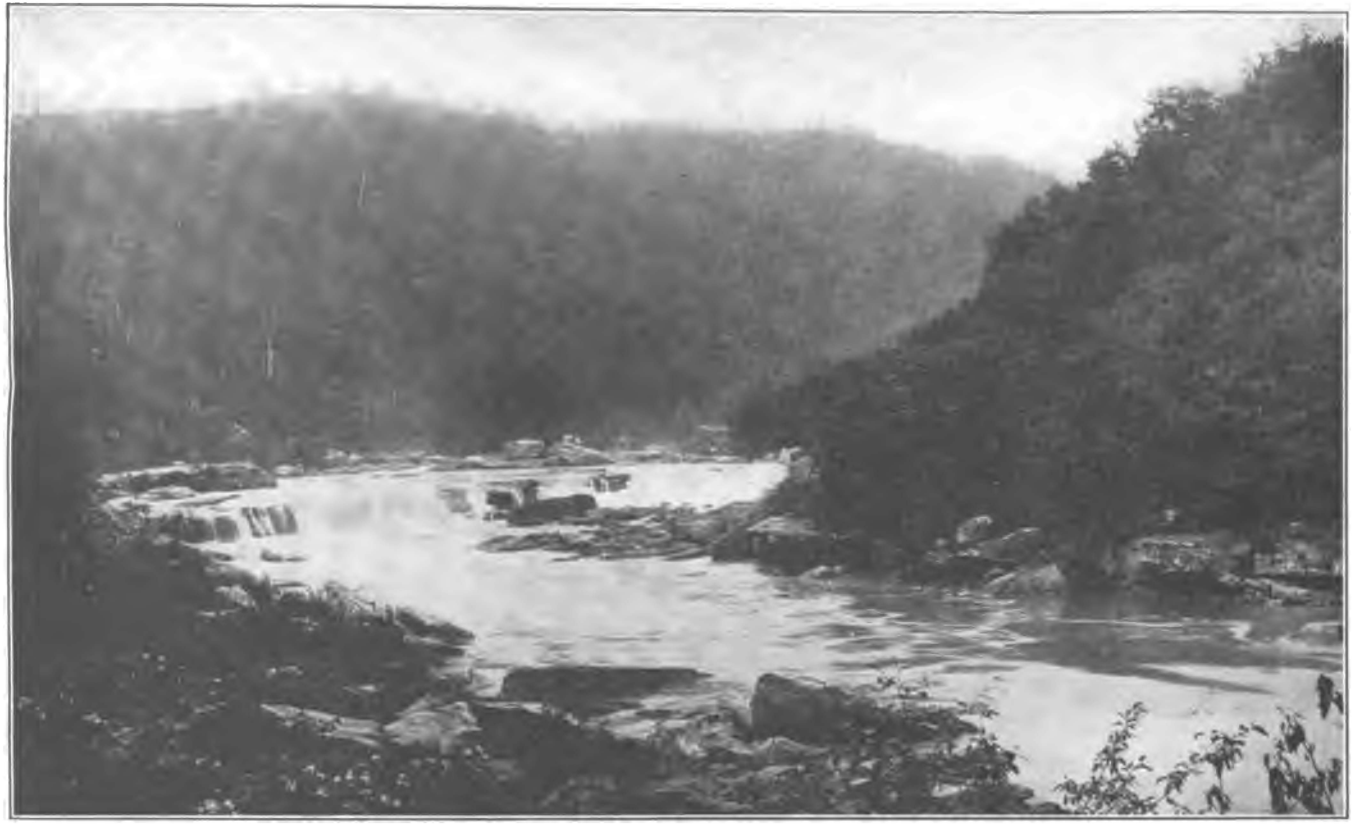

PLATE XXXII.—Upper Connoquenessing Sandstone at falls of Tygart Valley River, 1.2 miles southwest of Moatsville, Barbour County; Topography of Conemaugh, Allegheny, and Pottsville Series.

Lee J. Sandridge Coal Company, Mine No. 1—No. 574 on Map II.

On Fords Run of Tygart Valley, at Meriden; Lower Kittanning Coal; elevation, 1330′ B.

				Ft.	In
1.	Slate				
2.	Coal, hard	2′	8½″		
3.	Bone	0	7		
4.	Coal	2	7		
5.	Fire clay, plastic	0	1		
6.	Coal	0	4	6	3½
7.	Slate, pavement				

"Principal office, Meriden; butts, S. 78° E.; faces, S. 12° W.; greatest rise, southeast; daily capacity, 2500 tons; daily output, 500 tons; 40 miners and 20 laborers employed; electric haulage; coal shipped East for steam and domestic fuel; sample collected from Nos. 2 and 4 by D. D. Teets, Jr.; Lee J. Sandridge, President and Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 574** in the table of coal analyses at the end of this Chapter.

The following partial section was measured in another opening of the same company, that is not at present in operation:

Lee J. Sandridge Coal Company, Mine No. 4—No. 575 on Map II.

On Fords Run of Tygart Valley River, 0.6 mile east of Meriden; Lower Kittanning Coal; elevation, 1400′ B.

			Ft.	In.
Shale				
Coal	1′	6″		
Coal, bony	0	7		
Coal	1	5	3	6
Concealed				

Arthur Matthews Farm Mine—No. 576 on Map II.

On Fords Run, 1 mile southeast of Meriden; Lower Kittanning Coal; elevation, 1545′ B.

			Ft.	In.
Slate, black				
Coal	1′	4″		
Coal, bony	0	7		
Coal, soft	3	2	5	1
Slate, pavement				

Elijah Mayle Farm Mine—No. 577 on Map II.

On Fords Run, 0.9 mile southeast of Meriden; Lower Kittanning Coal; elevation, 1540′ B.

			Ft.	In.
Slate, black				
Coal	0′	4″		
Slate, dark	0	11		
Coal	1	8		
Coal, bony	0	6		
Coal, soft	2	6	5	11
Slate, pavement				

The **James Stemple Farm Mine (No. 578 on Map II)**, located on Fords Run, 2 miles southeast of Philippi, at an elevation of 1585′ B., showed 2′ 8″ of clean coal, one bench of the coal, apparently, being missing.

Lloyd Gall Farm Mine—No. 579 on Map II.

On the Tygart Valley River, 0.2 mile west of Meriden; Lower Kittanning Coal; elevation, 1320′ B.

			Ft.	In.
Slate				
Coal, soft	2′	1″		
Slate	0	7		
Coal	2	5	5	1
Slate				

Briscoe Morrill Farm Mine—No. 580 on Map II.

On a branch of Tygart Valley River, 0.5 mile northeast of Philippi; Lower Kittanning Coal; elevation, 1320′ B.

			Ft.	In.
Shale, sandy			10	0
Slate, black, cannel			0	7
Coal	1′	11″		
Coal, bony	0	8		
Coal, soft	2	3	4	10
Slate, pavement				

Since field work was completed in this locality, the above mine is being operated commercially under the name of **Morrill Coal Company.**

Prospect No. 581 on Map II, located along the public road on Anglins Run, 2 miles southeast of Philippi, at an elevation of 1560′ B., showed 2′ 2″ of soft coal, only one bench of the coal being visible.

The following mine, at the south edge of Philippi, has operated the coal on a commercial scale for several years:

Humphreys Coal Company Mine—No. 582 on Map II.

On the Tygart Valley River, 0.8 mile south of Philippi; **Lower Kittanning Coal**; elevation, 1330′ B.

				Ft.	In.
1.	Slate				
2.	Coal	1′	1″		
3.	Bone	1	3		
4.	Coal	1	4		
5.	Bone	0	8		
6.	Coal, hard	0	8		
7.	Coal, softer	1	5	6	5
8.	Slate, pavement				

"Principal office, Harrison Building, Philadelphia, Pa.; coal owned by Humphreys Colliery Company; daily capacity, 500 tons; daily output, 100 tons; 14 miners and 6 laborers employed; electric haulage; coal shipped East and West for steam fuel; butts, N. 81° 55′ E.; faces, N. 8° 05′ W.; greatest rise, southeast; sample collected from Nos. 2, 4, 6, and 7 of section by D. D. Teets, Jr.; J. M. Swick, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 582** in the table of coal analyses at the end of this Chapter.

The coal has been mined commercially for several years at Lillian, where the following information was secured:

Grafton Fuel Company Mine—No. 583 on Map II.

On the Tygart Valley River, 0.5 mile north of Lillian; **Lower Kittanning Coal**; elevation, 1361′ L.

				Ft.	In.
1.	Slate roof				
2.	Coal	1′	5½″		
3.	Bone, cannelly	0	8½		
4.	Coal	1	5		
5.	Bone	0	6		
6.	Coal	2	3	6	4
7.	Slate and fire clay, pavement				

"Principal office, Grafton; owner, Freeport Smokeless Coal Company, of Johnstown, Pennsylvania; daily capacity, 350 tons; daily output, 200 tons; 25 miners and 13 laborers employed; gasoline motor haulage; coal shipped northeast mostly for railroad steam fuel; butts,

N. 86° E.; faces, N. 4° W.; greatest rise, southeast; sample collected from Nos. 2, 4, and 6 of section in Room No. 7, No. 3 Butt, off 3rd Section, by D. D. Teets, Jr.; W. S. Brydon, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 583** in the table of coal analyses at the end of this Chapter.

A farm mine, located in the same vicinity, exhibits the following structure, according to Teets:

Talbott Farm Mine—No. 584 on Map II.

On the Tygart Valley River, 0.2 mile southeast of Lillian; Lower Kittanning Coal; elevation, 1420′ B.

			Ft.	In.
Slate, black, cannelly				
Coal, soft	1′	1″		
Bone, cannelly	0	7		
Coal	1	1		
Coal, bony	0	6		
Coal, soft	2	0	5	3
Slate, pavement				

Southeastward from Lillian up the Tygart Valley River, for several miles, there are no operations or prospects on the north side of the river at the horizon of the Lower Kittanning Coal, its commercial thickness in that region being therefore subject to some doubt although the coal may possibly be found if diggings be made through the surface drift. The following prospect, in the writer's belief, represents the Lower Kittanning, although it is regarded as the Upper Kittanning by Dr. White and Mr. Hennen:

H. M. Crawford and Company Prospect—No. 585 on Map II.

On the Tygart Valley River, at Adma; Lower Kittanning Coal; elevation, 1780′ B.

			Ft.	In.
Sandstone, massive, pebbly				
Coal, soft, 0″ to	0′	3″		
Slate, gray	0	5		
Coal, bony	0	10		
Coal, soft	1	5		
Slate, dark-gray	0	1		
Coal, soft	1	2	4	2
Slate, sandstone, etc., to base of main Adma Mine			55	0

As indicated by the section above, another coal is min at 55 feet below this prospect, which will be described und the Clarion Coal.

Lower Kittanning Coal, Cove District, Barbour.

In a considerable portion of Cove District, the Low Kittanning Coal lies several hundred feet under drainage alo the axis of the Belington Syncline, where it has been pro pected at several points by the diamond drill, the results some of these tests being published on preceding pages of th Chapter and showing a fair quality of coal. Several opening are available, however, both to the east and west of the sy cline, as follows:

Coal Prospect—No. 586 on Map II.

On the Tygart Valley River, 0.2 mile northeast of Cove Run St tion: Lower Kittanning Coal; elevation, 1250′ B.

	Ft.	In.
Sandstone, massive		
Coal, cannel	2	10
Concealed by debris		

Coal Prospect—No. 587 on Map II.

On Big Cove Run, 0.3 mile southeast of Cove Run Station; Low Kittanning Coal; elevation, 1245′ B.

			Ft.	In.
Sandstone, shaly			5	0
Slate, black, with plant fossils			3	0
Coal, cannel	0′	10″		
Coal, blocky	0	10		
Slate	0	2		
Coal, visible	0	4	2	2
Concealed by water				

The coal at the above prospect is reported by residents a being 6 feet thick, but the condition of the prospect was n such as to permit this statement to be verified.

Coal Prospect—No. 588 on Map II.

On the Tygart Valley River, 0.4 mile north of Moatsville Station: Lower Kittanning Coal; elevation, 1225′ B.

			Ft.	In.
Slate, dark				
Coal, soft	3′	2″		
Shale, gray	0	6		
Coal, soft	0	5		
Coal, bony	0	6	4	7
Slate, pavement, and concealed			5	0
Sandstone, massive, Homewood				

Coal Prospect No. 589 on Map II, located on Teter Creek, 0.2 mile southeast of Moatsville Station, showed 4 feet of coal and slate, at an elevation of 1255′ B.

The **A. J. Gale Farm Mine (No. 590 on Map II),** located on Teter Creek, 0.1 mile west of Moatsville village, at an elevation of 1250′ B., was partly filled with water, but appeared to have a thickness of about 3 feet.

Fred Ritter Farm Mine—No. 591 on Map II.

On Glade Run, 0.3 mile southwest of Moatsville village; Lower Kittanning Coal; elevation, 1270′ B.

			Ft.	In.
Sandstone, massive				
Coal, soft	2′	7″		
Slate, dark	0	9		
Coal	0	4	3	8
Sandstone, massive				

In the region east of the Belington Syncline, the following opening appears to represent the Lower Kittanning:

Henry Bollner Farm Mine—No. 592 on Map II.

On a branch of Brushy Fork of Teter Creek, 2.8 miles northeast of Valley Furnace; Lower Kittanning Coal; elevation, 2280′ B.

			Ft.	In.
Shale, gray				
Coal, streak				
Shale, gray			4	0
Coal, soft	0′	9″		
Coal, hard	0	2		
Coal, soft, columnar	3	2	4	1
Slate, pavement				

On the Tygart Valley River, the coal
opened at **Prospect No. 593 on Map II,** 1 mil
Moatsville Station, at an elevation of 1325′ B.
pect had fallen shut, there being considerab
dump.

Sanford Street Farm Mine—No. 594 on

On Laurel Creek, 0.8 mile east of Arden; Lower
elevation, 1380′ B.

Shale, sandy			
Coal	2′	2″	
Coal, bony	0	7	
Coal, soft	2	6	......
Slate, pavement			

Jefferson Digman Farm Mine—No. 595 o

On a branch of Laurel Creek, 2.1 miles southeast
Kittanning Coal; elevation, 1500′ B.

Slate, black			
Coal	0′	4″	
Slate, dark	1	6	
Coal	2	10	
Coal, bony	0	10	
Coal, soft	2	0	......
Slate, pavement			

The **Aldine Stemple Farm Mine (No. 59**
located on Laurel Creek, 1.7 miles northwest
elevation of 1475′ B., had fallen shut, but was r
measured 4 feet.

Lower Kittanning Coal, Glade District,

In Glade District, the Lower Kittanning
age along the axis of the Belington Syncline, w
prospected by the diamond drill with fair re
by the records of some of these borings, publish
pages of this Chapter. A few openings have
and west of the syncline, the following being n

J. F. Wilson and Brother Farm Mine—No. 597 on Map II.

On Mill Run of Teter Creek, 1.9 miles southeast of Valley Furnace; Lower Kittanning Coal; elevation, 1690′ B.

				Ft.	In.
1.	Sandstone				
2.	Coal, soft	2′	0″		
3.	Smut seam	0	2		
4.	Coal	1	11	4	1
5.	Slate, pavement				

A sample was collected from Nos. 2 and 4 of section, the composition of which is published under **Mine No. 597** in the table of coal analyses at the end of this Chapter.

Mack Phillips Farm Mine—No. 598 on Map II.

On Jimmy Run of Teter Creek, 4 miles southeast of Nestorville; Lower Kittanning Coal; elevation, 2410′ B.

			Ft.	In.
Shale, gray				
Coal, soft, columnar	1′	10″		
Coal, hard, bony	0	2	2	0
Slate, pavement				

The **Perry Gainer Coal Stripping (No. 599 on Map II)**, located on Teter Creek, 1 mile north of Kirt, at an elevation of 1785′ B., appears to represent the Lower Kittanning. The place had fallen shut but the coal was reported about 2′ 6″ thick.

Harrison Poling Farm Mine—No. 600 on Map II.

On Laurel Creek, 1 mile northwest of Vannoys Mill; Lower Kittanning Coal; elevation, 1580′ B.

	Ft.	In.
Slate, black	3	0
Coal, medium-soft	3	7
Slate, bony	1	2
Fire clay		

Lower Kittanning Coal, Barker District, Barbour

In Barker District, the southward rise of the rocks brings the Lower Kittanning above drainage along the Tygart Valley between Dartmoor and the Randolph County Line, and here the coal has been mined extensively for railroad shipment. In this region the seam that is mined has a total thickness of 10 to 12 feet, apparently representing both the Middle and Lower Kittanning as there is a shale or rock parting 2 or 3 feet thick that divides the coal into two distinct benches. A few openings have been made along the western slope of the Laurel Ridge, where the coal is rising rapidly eastward, the two following prospects being in this region:

Joseph Yeager Farm Mine—No. 601 on Map II.

On a branch of Hunter Fork of Sugar Creek, 1.8 miles southeast of Huffman; Lower Kittanning Coal; elevation, 1855′ B.

			Ft.	In.
Slate, black			2	0
Coal, soft	1′	8″		
Slate, bony	1	6		
Coal, bony	1	0	4	2
Slate, pavement				

Tazewell Digman Farm Mine—No. 601A on Map II.

On Hunter Fork of Sugar Creek, 2.7 miles northeast of Belington; Lower Kittanning Coal; elevation, 2130′ B.

			Ft.	In.
Shale, dark, sandy			10	0
Coal	0′	7″		
Slate, dark	0	6		
Coal, soft	1	3		
Slate, dark, hard	0	3		
Coal	0	7		
Slate, dark	0	4		
Coal	0	10	4	4
Slate, pavement				

Coal Exposure—No. 602 on Map II.

In the public road, on Mill Creek, 2.1 miles southeast of Belington: Middle and Lower Kittanning Coal; elevation, 2055′ B.

			Ft.	In.
Shale, sandy				
Coal	3′	0″		
Slate, dark	5	0		
Coal	1	3		
Slate, dark	3	0		
Coal	1	0	13	3
Concealed				

At **Coal Mine No. 603 on Map II**, located at Dartmoor on the Tygart Valley River, the coal was once mined by a small slope, the elevation of the coal seam being about 1715′ B. This operation has been abandoned for several years and the old entry is closed. The following mine in the same vicinity operates the coal on a large scale:

Davis Coal and Coke Company, Dartmoor Mine No. 4—No. 604 on Map II.

On the Tygart Valley River, 0.7 mile south of Dartmoor; Middle and Lower Kittanning Coal; elevation, 1720′ B.

				Ft.	In.
1.	Slate				
2.	Coal	3′	1″		
3.	Bone	0	7		
4.	Coal	1	0		
5.	Fire clay, plastic	0	1		
6.	Coal	1	0	5	9
7.	Slate, pavement				

"Principal office, Cumberland, Md.; daily capacity, 1200 tons; daily output, 700 tons; 100 miners and 40 laborers employed; electric haulage; coal shipped East for steam and domestic use; butts, S. 30° W.; faces, N. 30° W.; greatest rise, southeast; sample collected from Nos. 2, 4, and 6 of section, in Room No. 9, 2nd Right, 2nd Section, by D. D. Teets, Jr.; Geo. Adams, Mine Foreman, authority for mine data."

The composition of this sample is published under **Mine No. 604** in the table of coal analyses at the end of this Chapter.

The section as measured above by Teets shows only the Lower Kittanning member. The following section measured along the slope near the mine mouth shows both the Middle and Lower Kittanning members and is of important stratigraphic interest:

				Ft.	In.
Shale					
Coal, soft	2′	2″	Middle Kittanning	3	6
Sulphur rock	0	9			
Coal, soft	0	7			
Shale, gray				3	6
Coal, soft	3′	2″	Lower Kittanning	6	3
Shale, gray	0	7			
Coal, soft	0	11			
Coal, hard	1	1			
Coal, hard, reported	0	6			

The following mine was examined several years ago by A. P. Brady and the results published in Volume II(A), page 510, of the Survey, under the title of **Junior Coal Company**, but is now under control of the Davis Colliery Company:

Davis Colliery Company, Junior Mine No. 4—No. 605 on Map II.

On the Tygart Valley River, 0.4 mile northeast of Junior; Lower Kittanning Coal; elevation, 1737' L.

				Ft.	In.
1.	Sandstone				
2.	Coal and slate, mixed				
3.	Coal	1'	9"		
4.	Slate	0	2		
5.	Coal	0	8		
6.	Slate	1	0		
7.	Coal	3	2		
8.	Slate	0	8		
9.	Coal	1	1	8	6

"Butts, S. 78° E.; faces, S. 12° W.; daily capacity (1915), 400 tons; sample collected from Nos. 7 and 9 of section by A. P. Brady."

The composition of this sample is published under **Mine No. 605** in the table of coal analyses at the end of this Chapter.

There are 75 beehive coke ovens at this mine, a sample of the coke taken by Mr. Brady giving the following analysis:

	Per cent.
Moisture	0.08
Volatile Matter	0.90
Fixed Carbon	84.97
Ash	14.05
Total	100.00
Sulphur	0.94
Phosphorus	0.018

The following table of coke analyses from the Junior Mine was furnished Teets over the signature of F. S. Johnson, Chemist:

Sample No.	1 Per cent.	2 Per cent.	3 Per cent.
Moisture	0.29	0.33	0.13
Volatile Matter	0.59	0.83	1.05
Fixed Carbon	85.61	84.47	84.33
Ash	13.47	14.46	14.50
Totals	99.96	100.09	100.01
Sulphur	0.99	1.01	1.04

Sample No. 1, average for the month of August, 1914.
Sample No. 2, average for the month of September, 1914.
Sample No. 3, average for the month of October, 1914.

The following mine was previously examined and sampled by Ray V. Hennen and the results published in Volume II(A), page 517, under the name of the **Miller Coal and Coke Company**:

Gage Coal and Coke Company, Sarah Mine—No. 606 on Map II.

On the Tygart Valley River, at Gage; **Lower Kittanning Coal**, elevation, 1800′ B.

				Ft.	In
1.	Sandstone				
2.	Coal, bony cannel	0′	10″		
3.	Slaty fire clay, 1′ to	1	8		
4.	Coal, soft, slightly bony at top	1	8		
5.	Bone, 0¼″ to	0	0½		
6.	Coal, soft	1	1		
7.	Slate, gray, 1′ 6″ to	0	5		
8.	Coal, soft, 0″ to	0	1		
9.	Slate, 0½″ to	0	1		
10.	Coal, soft	1	1		
11.	Slate, gray	0	3½		
12.	Coal, soft	0	4½	7	7½
13.	Slate				

"Principal office, H. W. Oliver Building, Pittsburgh, Pa.; daily capacity, 300 tons; 44 miners and 20 laborers employed; electric haulage; coal used for coke and steam fuel; butts, N. 80° E.; faces, S. 10° E.; greatest rise, southeast; sample collected from Nos. 4, 5, 6, and 10 of section by Ray V. Hennen; A. B. Spencer, Superintendent, authority for mine data." (Data revised to November, 1915.—D. B. R.).

The composition of this sample is published under **Mine No. 606** in the table of coal analyses at the end of this Chapter.

The company has 60 beehive ovens where 180 tons of the output are used, giving a daily coke production of 135 tons. A sample of the 48-hour product, taken by Hennen at the time of his visit, shows the following analysis:

	Per cent.
Moisture	0.35
Volatile Matter	0.55
Fixed Carbon	87.72
Ash	11.38
Sulphur	0.63
Phosphorus	0.098

The coal has been mined extensively along Beaver Creek, where it is rising rapidly eastward toward the Laurel Ridge. Some of these mines are in Randolph County and will be described under Leadsville District. The two following sections were measured at old workings that have now been abandoned, owing to the exhaustion of the coal:

Davis Coal and Coke Company, Weaver Mine No. 3 (South Opening)—No. 607 on Map II.

On Beaver Creek, 0.8 mile northeast of Weaver; **Middle and Lower Kittanning Coal**; elevation, 1965′ B.

			Ft.	In.
Coal, thickness concealed				
Sandstone			0	10
Coal	0′	7″		
Slate, black, bony	0	7		
Coal, soft, columnar	3	8	4	10
Concealed by mud				

Davis Coal and Coke Company, Weaver Mine No. 3 (North Opening)—No. 608 on Map II.

On Beaver Creek, 0.9 mile northeast of Weaver; **Lower Kittanning Coal**; elevation, 1995′ B.

			Ft.	In.
Slate, black				
Coal, soft, columnar	3′	3″		
Slate, black	0	5		
Coal, soft, columnar	2	5	6	1
Slate, pavement				

Judging from its appearance, the upper bench recorded at the north opening corresponds to the lower bench at the south opening, where the lower portion of the seam is concealed by mud.

The following is a new mine recently opened for railroad shipment:

Davis Coal and Coke Company, Mine No. 5—No. 609 on Map II.

On Beaver Creek, 0.2 mile northeast of Tigheview; Lower Kittanning Coal; elevation, 2000′ B.

				Ft.	In.
1.	Slate				
2.	Coal	1′	6″		
3.	Slate	0	1		
4.	Coal	2	0		
5.	Shale	0	4		
6.	Coal	2	2	6	1
7.	Slate, pavement				

"Principal office, Cumberland, Md.; daily capacity, 150 tons; daily output, 100 tons; 16 miners and 4 laborers employed; mule haulage; coal shipped East for steam fuel; butts, N. 80° E.; faces, N. 10° W.; greatest rise, southeast; sample collected from Nos. 2, 4, and 6 of section by D. D. Teets, Jr.; H. H. Harrison, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 609** in the table of coal analyses at the end of this Chapter.

Another operation has been recently started by **W. H. Green (Mine No. 610 on Map II)**, on the opposite side of Beaver Creek, 0.3 mile north of Tigheview, where the coal has an elevation of 1950′ B. At the time of the writer's visit to this locality, this new opening had fallen shut and the coal could not be measured, but it should differ but little from the coal in Mine No. 609.

Lower Kittanning Coal, Valley District, Barbour.

In Valley District, the Lower Kittanning has been mined at numerous points for local domestic use and an attempt was made to mine it for railroad shipment at one place, but the plant is now abandoned. The following openings were noted by Teets:

The **M. N. O'Brien Farm Mine (No. 611 on Map II)**, located on the Tygart Valley River, 0.6 mile northwest of O'Brien, at an elevation of 1800′ B., had fallen shut and could not be measured, but was reported to have shown a total thickness of 6 feet. The **M. N. O'Brien Farm Mine (No. 612 on Map II)**, located at O'Brien, measured a total of 9′ 0″, as shown in detail in the section for that place, page 114, its tidal elevation being 1840′ B. A sample was collected from this opening, the composition of which is published under **Mine No. 612** in the table of coal analyses at the end of this Chapter.

William Morgan Farm Mine—No. 613 on Map II.

On the Tygart Valley River, 0.7 mile southwest of Clements; Lower Kittanning Coal; elevation, 1835′ B.

			Ft.	In.
Coal, hard	2′	6″		
Slate, gray	0	6		
Coal, soft	0	6		
Slate, gray	0	9		
Coal, soft	0	8		
Slate	0	6		
Coal, soft	2	2		
Coal, hard, bony	1	3	8	10
Slate, pavement				

The following mine, now abandoned, was operated for a short time for railroad shipment, but the seam proved to have too much slate and bone for successful mining. It was examined and sampled by A. P. Brady and the results published in Volume II(A), page 509:

Valley Coal and Coke Company Mine—No. 614 on Map II.

On the south side of Tygart Valley River, at Wilmoth Ford; Lower Kittanning Coal; elevation, 1732′ L.

			Ft.	In.
Sandstone				
Slate				
Draw slate				
Coal	0′	10″		
Bone coal	0	3		
Coal	0	9		
Bone coal	0	3		
Coal	0	9		
Bone coal	0	2		
Coal	1	6		
Bone coal	0	2		
Coal	1	5		

			Ft.	In.
Bone coal	0′	2″		
Coal	1	0	7	3

"Butts, S. 78° E.; faces, S. 12° W.; greatest rise, N. 45° W."

The composition of the sample is published under **Mine No. 614** in the table of coal analyses at the end of this Chapter. The section measured by Mr. Brady is not satisfactory because of its failure to distinguish between slate and bone. Another and more accurate section, measured by Teets, is published in the section for Wilmoth Ford, page 111, of this Report. This mine has recently been reopened for commercial shipment.

The coal is under drainage along the syncline in the vicinity of Belington, but emerges above the river farther south, the following exposure being noted on the Valley District side of the river:

D. C. Carpenter Farm Mine—No. 615 on Map II.

On Zebs Creeks, 2 miles west of Junior; **Middle and Lower Kittanning Coal**; elevation, 1910′ B.

			Ft.	In.
Slate				
Coal	1′	2″		
Slate, dark	1	8		
Coal, hard	0	11		
Sandstone, slaty	1	0		
Shale, gray	3	4		
Coal, soft	1	11	10	0
Slate, pavement				

Numerous core tests have been drilled in this region, the records of some of which are available to show the coal, as published on preceding pages of this Chapter.

Several openings have been made along the waters of Middle Fork River, the following being noted by Teets:

W. W. Kerr Farm Mine—No. 616 on Map II.

On Middle Fork River, 0.6 mile east of Audra; **Lower Kittanning Coal**; elevation, 1880′ B.

			Ft.	In.
Sandstone, massive, roof, **East Lynn**			20	0
Coal	2′	0″		
Slate	0	8		

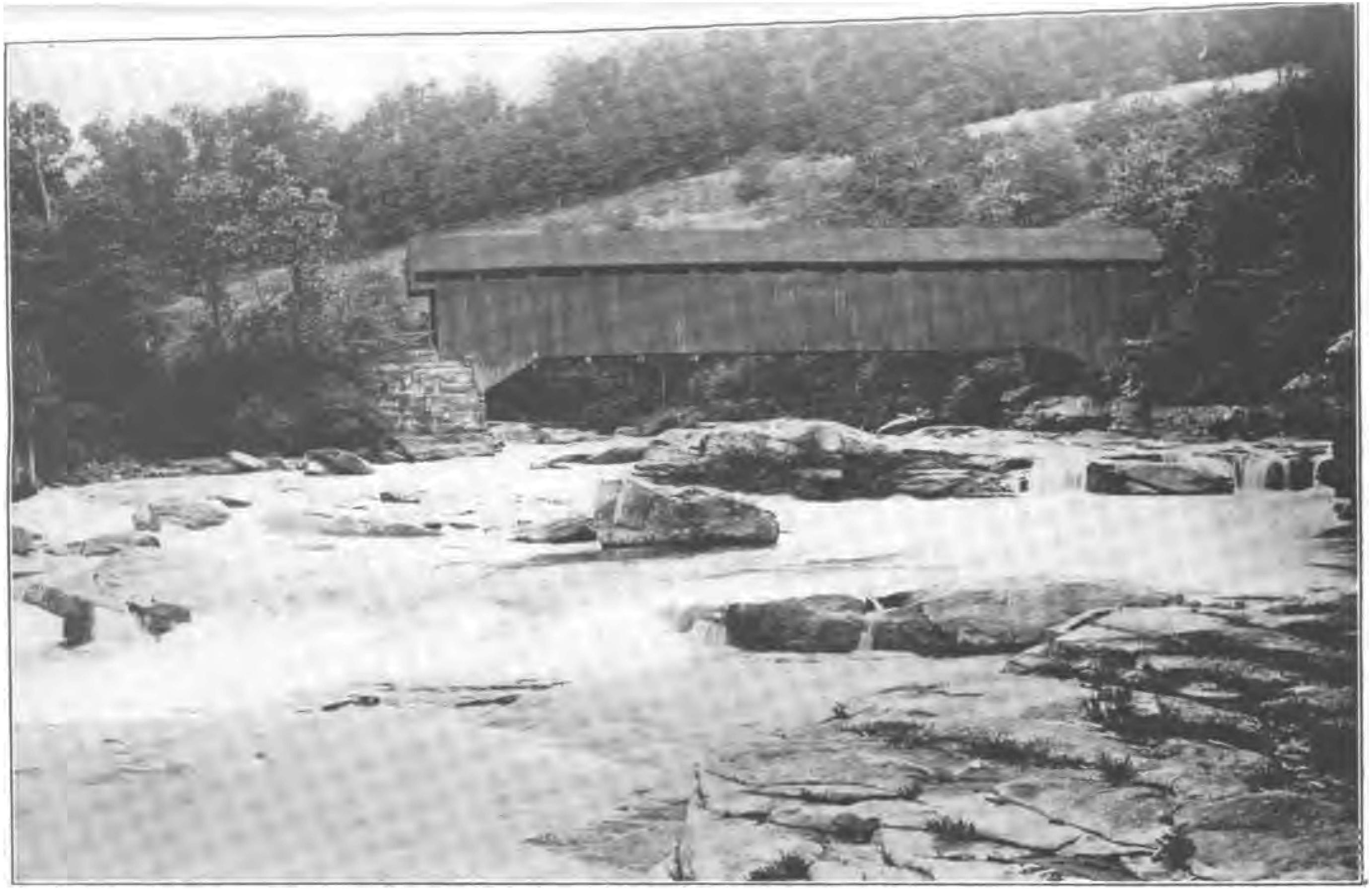

PLATE XXXIII.—Falls over Upper Connoquenessing Sandstone along Middle Fork River at Audra, Barbour County; Topography of Pottsville Series.

			Ft.	In.
Coal	1′	6″		
Slate	0	4		
Coal	1	0	5	6
Slate, pavement				

The **A. D. Zirkle Farm Mine (No. 617 on Map II),** locate on Middle Fork River, 1 mile east of Swamp Run, at an eleva tion of 1935′ B., had fallen shut, but the seam was reporte 5 feet thick, including coal and slate partings. The **Fran Wiseman Farm Mine (No. 618 on Map II),** located on branch of Hanging Run, 2 miles southeast of Swamp Run, a an elevation of 2055′ B., had fallen shut, but was reported t have shown a total thickness of 3 feet.

Wesley Davis Farm Mine—No. 619 on Map II.

On Middle Fork River, 2 miles southeast of Swamp Run; Lowe Kittanning Coal; elevation, 2035′ B.

			Ft.	In.
Slate, black				
Coal	1′	0″		
Shale, slaty	0	7		
Coal	0	7		
Slate, dark	1	0		
Coal, soft	1	10	5	0
Slate, pavement				

H. D. Steets Farm Mine—No. 620 on Map II.

On Hanging Run, 1.2 miles north of Talbott; Lower Kittannin Coal; elevation, 2045′ B.

			Ft.	In.
Sandstone, massive			10	0
Coal, soft	2′	0″		
Coal, bony	0	8		
Coal	0	4		
Shale, gray, slaty	0	5		
Coal	0	6		
Shale, slaty	0	6		
Coal	0	9	5	2
Slate, pavement				

Columbus Shomoe Farm Mine—No. 621 on Map II.

On a branch of Laurel Run of Tygart Valley, 0.6 mile east of Talbott; Lower Kittanning Coal; elevation, 2115′ B.

			Ft.	In.
Sandstone, visible			8	0
Slate, black			1	2
Coal, soft	2′	3″		
Coal, bony	0	4		
Slate, dark	0	4		
Coal, bony	0	4		
Coal, soft	0	11	4	2
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 621** in the table of coal analyses at the end of this Chapter.

Peter Devitt Farm Mine—No. 622 on Map II

On a branch of Laurel Run, 0.6 mile east of Talbott; Lower Kittanning Coal; elevation, 2080′ B.

			Ft.	In.
Slate				
Coal, soft	2′	9″		
Coal, bony	0	2		
Slate, dark	0	4		
Coal, soft	1	3	4	6
Slate, pavement				

A sample was collected at this mine, the composition of which is published under **Mine No. 622** in the table of coal analyses at the end of this Chapter.

Henry George Farm Mine—No. 623 on Map II.

On Devil Run, 1.8 miles northeast of Lantz; Lower Kittanning Coal; elevation, 2105′ B.

			Ft.	In.
Sandstone, massive, visible			5	0
Slate			0	2
Coal, soft	2′	0″		
Coal, bony	0	2		
Slate, gray	0	3		
Coal, bony	0	2		
Coal	1	7	4	2
Slate				

A sample was collected from this mine, the composition of which is published under **Mine No. 623** in the table of coal analyses at the end of this Chapter.

James George Farm Mine—No. 624 on Map II.

On Devil Run, 1.6 miles northeast of Lantz; **Lower Kittanning Coal**; elevation, 2135′ B.

			Ft.	In.
Sandstone, roof				
Coal, slaty	0′	2″		
Coal	2	4		
Slate, gray	0	5		
Coal, bony	0	3		
Coal	1	3	4	5
Slate, pavement				

John King Farm Mine—No. 625 on Map II.

On Middle Fork River, 0.9 mile northeast of Lantz; **Lower Kittanning Coal**; elevation, 2155′ B.

			Ft.	In.
Sandstone, massive			10	0
Slate, black			0	10
Coal, soft	2′	2″		
Slate, bony	0	9		
Coal, soft	1	10	4	9
Slate, pavement				

Middle and Lower Kittanning Coals, Warren District, Upshur.

In Warren District, the horizon of the Lower Kittanning Coal is almost entirely under drainage, and little information is available regarding it as no diamond drill holes have been put down deep enough to reach it, and there are only a few oil well records available, only part of which show coal. At the extreme eastern end of the District, the coal is above drainage along the Buckhannon River, where Teets secured the following section:

Henry Jackson Farm Mine—No. 626 on Map IV.

On Buckhannon River at Wentz Ford; Lower Kittanning Coal; elevation, 1390′ B.

			Ft.	In.
Sandstone, roof				
Coal	2′	0″		
Slate	1	0		
Coal	2	0	5	0

Middle and Lower Kittanning Coals, Union District, Upshur

In **Buckhannon District,** the coal is not above drainage, and knowledge of it through well records and drill holes is scanty, but in **Union** it has been prospected and mined extensively for local domestic use. Both the Middle and Lower Kittanning members are frequently found. These coals are usually low in sulphur, but are much impaired in commercial value by the presence of thick slates that must be handled in mining. Several openings have been made along Handy Camp Run of Buckhannon River, which Teets reports as follows:

James McDermott Farm Mine—No. 627 on Map IV.

On Handy Camp Run, 0.6 mile southeast of Wentz Ford; Lower Kittanning Coal; elevation, 1530′ B.

			Ft.	In.
Slate, cannel				
Coal	1′	6″		
Slate	0	4		
Coal, bony	0	4	2	2
Slate			0	6

The **B. F. Thompson Farm Mine** (No. 628 on Map IV), located 0.7 mile north of Five Forks, at an elevation of 1765′ B., had fallen shut, but was reported 4 to 5 feet thick.

Clinton Bennett Farm Mine—No. 629 on Map IV.

On Handy Camp Run, 0.5 mile northeast of Five Forks; Lower Kittanning Coal; elevation, 1810′ B.

			Ft.	In.
Shale, slaty, roof				
Coal, soft	1′	3″		

			Ft.	In.
Slate	0'	4"		
Coal	0	4		
Slate	0	3		
Coal	0	3		
Slate	0	11		
Coal, soft	2	2	5	6
Slate, pavement				

L. F. Sutherland Farm Mine—No. 630 on Map IV.

On the head of Handy Camp Run, 0.5 mile south of Five Fork Lower Kittanning Coal; elevation, 1856' L.

			Ft.	In.
Slate, dark, cannelly				
Coal, soft	1'	7"		
Slate	0	1		
Coal	0	2		
Shale, gray	1	0		
Coal, soft	2	1	4	11
Slate, pavement				

John and Martin Welch Farm Mine—No. 631 on Map IV.

On Handy Camp Run, 0.8 mile southeast of Five Forks; Middl Kittanning Coal; elevation, 1915' B.

			Ft.	In.
Sandstone, roof				
Coal, soft	1'	2"		
Slate	0	3		
Coal	0	6		
Slate	0	2		
Coal	1	8	3	9
Slate				

On Sand Run and its various branches, numerous openings have been made, the following being reported by Teets

William Moreland Farm Mine—No. 632 on Map IV.

On Sand Run, 0.8 mile south of Wentz Ford; Lower Kittannin Coal; elevation, 1425' B.

			Ft.	In.
Slate, dark, cannelly				
Coal	0'	3½"		
Slate, black	0	1		
Coal, soft	1	5½		
Bone	0	6		
Slate, gray	0	3		
Coal, bony, visible	1	4	3	11

The coal was once opened at the **Henry Davis Farm Mine (No. 633 on Map IV)**, at Hinkle, but this mine had fallen shut, its elevation being 1466′ L.

Yeager Farm Mine—No. 634 on Map IV.

On Little Laurel Fork of Sand Run, 0.8 mile southeast of Hinkle; **Lower Kittanning Coal**; butts, N. 86° W.; elevation, 1580′ B.

			Ft.	In.
Slate, black, cannelly, visible			4	0
Coal, soft	1′	4″		
Slate, black	0	1		
Coal, bony	0	8		
Coal, good, hard	1	6	3	7
Slate, pavement				

P. P. Lane Farm Mine—No. 635 on Map IV.

On Little Laurel Fork, 1.6 miles east of Overhill; **Lower Kittanning Coal**; elevation, 1787′ L.

			Ft.	In.
Slate, black, cannelly				
Coal	0′	10″		
Coal, bony	0	8		
Coal, soft	2	2		
Shale	0	11		
Coal, reported	1	6	6	1

At the **Granville Dean Farm Mine (No. 636 on Map IV)**, located on Little Laurel Fork, 0.9 mile southwest of Vegan, the Middle Kittanning has been opened at an elevation of 1815′ B., showing 3′ 3″ of clean coal.

John See Farm Mine—No. 637 on Map IV.

On Little Laurel Fork, 0.9 mile southwest of Vegan; **Lower Kittanning Coal**; elevation, 1805′ B.

			Ft.	In.
Slate, dark, cannelly				
Coal, soft	1′	3″		
Coal, bony	0	8		
Coal, soft	1	11	3	10

John See Farm Mine—No. 638 on Map IV.

On Little Laurel Fork, 0.8 mile southwest of Vegan; **Middle Kittanning Coal**; elevation, 1840' B.

			Ft.	In.
Slate, dark, cannelly				
Coal, soft	1'	1"		
Coal, harder	0	8		
Coal, soft	2	0	3	9
Slate, pavement				

The Middle Kittanning Coal has been opened also at the **P. L. Morgan Farm Mine (No. 639 on Map IV)**, located on Little Laurel Fork, 0.3 mile southwest of Vegan, at an elevation of 1840' B., but had fallen shut and could not be measured.

Farm Mine—No. 640 on Map IV.

On Middle Fork of Sand Run, 1.4 miles southeast of Hinkle; **Lower Kittanning Coal**; elevation, 1665' B.

			Ft.	In.
Slate, cannelly				
Coal	1'	6"		
Slate	0	1		
Coal	0	2		
Coal, bony	0	8		
Coal, soft	1	4	3	9
Slate, pavement				

Farm Mine—No. 641 on Map IV.

On Middle Fork of Sand Run, 1.7 miles southeast of Hinkle; **Lower Kittanning Coal**; elevation, 1710' B.

			Ft.	In.
Slate, dark, cannelly				
Coal, soft	1'	6 "		
Slate	0	0½		
Coal	0	3½		
Coal, bony	0	7		
Coal, soft	1	3	3	8
Slate, pavement				

Edward Shreve Farm Mine—No. 642 on Map IV.

On Middle Fork of Sand Run, 1.3 miles northwest of Vegan: **Middle Kittanning Coal**; elevation, 1820′ B.

			Ft.	In.
Slate				
Coal, soft	1′	2″		
Slate	0	0½		
Coal, soft	1	10½	3	1
Slate, pavement				

Gideon Griffith Farm Mine—No. 643 on Map IV.

On Middle Fork of Sand Run, 0.9 mile southwest of Vegan; **Lower Kittanning Coal**; elevation, 1800′ B.

			Ft.	In.
Slate, dark, cannelly				
Coal, hard	0′	5″		
Coal, soft	1	1		
Slate	0	0½		
Coal	0	2		
Coal, bony	0	4½		
Coal, hard	0	4		
Coal, softer	1	4	3	9
Slate, pavement				

Lydia Cutright Farm Mine—No. 644 on Map IV.

On Middle Fork of Sand Run, 0.8 mile northwest of Vegan: **Middle Kittanning Coal**; elevation, 1850′ B.

			Ft.	In.
Slate				
Coal, soft	1′	3″		
Slate	0	0½		
Coal, soft	1	10½	3	2
Slate, pavement				

J. W. Dickinson Farm Mine—No. 645 on Map IV.

On Laurel Fork, 1.5 miles southeast of Hinkle; **Lower Kittanning Coal**; butts, N. 87° W.; elevation, 1715′ B.

			Ft.	In.
Slate, cannelly, visible			4	0
Coal, block	1′	6″		
Slate, black	0	1		
Coal, slaty	0	6		
Slate, black	0	2		
Coal, hard	1	10	4	1
Slate				

Elizabeth Gregory Farm Mine—No. 646 on Map IV.

On Laurel Fork, 1.7 miles southeast of Hinkle; Lower Kittanning Coal; elevation, 1735' B.

			Ft.	In.
Slate				
Coal, block	1'	5"		
Slate, black	0	1		
Coal, bony	0	6		
Slate, black	0	2		
Coal, visible	1	6	3	8

William Crites Farm Mine—No. 647 on Map IV.

On Left Fork, 0.4 mile east of Overfield; Middle Kittanning Coal; butts; S. 88° W.; elevation, 1550' B.

			Ft.	In.
Shale, sandy				
Slate, black, cannelly			1	0
Coal, soft	1'	0"		
Coal, bony	0	11		
Coal, soft	1	10	3	9
Slate, pavement				

R. J. Crosby Farm Mine—No. 648 on Map IV.

On Left Fork of Sand Run, 0.5 mile east of Overhill; Lower Kittanning Coal; butts, east and west; elevation, 1575' B.

			Ft.	In.
Slate, dark, cannelly				
Coal, soft	1'	6"		
Coal, bony	0	8		
Coal	1	10	4	0
Slate, pavement				

Charles Holland Farm Mine—No. 649 on Map IV.

On Left Fork of Sand Run, 0.6 mile east of Overhill; Lower Kittanning Coal; elevation, 1595' B.

			Ft.	In.
Slate				
Coal, soft	1'	6"		
Coal, bony	0	7		
Coal	1	10	3	11
Slate				

Ida Norvell Farm Mine—No. 650 on Map IV.

On Beech Run of Left Fork of Sand Run, 1.2 miles southeast of Overhill; Lower Kittanning Coal; elevation, 1700′ B.

			Ft.	In.
Slate				
Coal, soft	0′	11″		
Coal, bony	0	8		
Coal, soft	2	2	3	9
Slate				

S. N. Cutright Farm Mine—No. 651 on Map IV.

On Left Fork of Sand Run, 1.1 miles southeast of Overhill; Lower Kittanning Coal; elevation, 1715′ B.

			Ft.	In.
Slate, cannelly				
Coal, soft	1′	6″		
Coal, bony	0	7		
Coal, soft	1	10	3	11
Slate				

Charles E. Hiner Farm Mine—No. 652 on Map IV.

On Left Fork of Sand Run, 1.7 miles southeast of Overhill; Lower Kittanning Coal; elevation, 1745′ B.

			Ft.	In.
Concealed from Middle Kittanning Coal			25	0
Slate, black, cannelly			6	0
Coal	0′	10″		
Shale, slaty	0	7		
Coal	0	2		
Shale, gray	0	11		
Coal, soft, visible	1	6	4	0
Concealed				

The Middle Kittanning is also opened in the same hillside and shows the following structure:

Charles E. Hiner Farm Mine—No. 653 on Map IV.

On Left Fork of Sand Run, 1.7 miles southeast of Overhill; Middle Kittanning Coal; elevation, 1780′ B.

			Ft.	In.
Slate, black, cannelly			4	0
Coal, soft	1′	3″		
Coal, bony	0	8		
Coal, soft	1	3	3	2
Concealed and slate to Lower Kittanning			31	0

William Tighe Farm Mine—No. 654 on Map IV.

On Left Fork of Sand Run, 1.1 miles northwest of Sand Run Station; Lower Kittanning Coal; elevation, 1870′ B.

			Ft.	In.
Slate				
Coal, soft	0′	11″		
Slate, gray	0	4		
Coal, soft	0	8		
Shale, gray	0	8		
Coal, soft	1	10	4	5
Slate				

At **Coal Exposure No. 655 on Map IV,** on Left Fork of Sand Run, 0.7 mile north of Sand Run Station, the Lower Kittanning shows a thickness of 5 feet, at its crop along the Parkersburg and Staunton Turnpike, its elevation there being 1950′ B.

Bentley and Gerwig Farm Mine—No. 656 on Map IV.

On Left Fork of Sand Run, 1.1 miles northeast of Sand Run Station; Lower Kittanning Coal; elevation, 2055′ B.

			Ft.	In.
Slate, black, cannelly				
Coal, soft	0′	8″		
Slate	0	4		
Coal	0	10		
Shale, gray	0	10		
Coal	0	11	3	7
Slate				

E. A. Hinzman Farm Mine—No. 657 on Map IV.

On a branch of Left Fork of Sand Run, 0.8 mile southeast of Vegan; Lower Kittanning Coal; elevation, 1955′ B.

			Ft.	In.
Slate, black, cannelly				
Coal, bony	0′	6″		
Shale, gray	0	10		
Coal, bony	0	6		
Coal, soft	1	8	3	6
Slate, pavement				

A few openings have been made in Union District on the waters of Middle Fork River, and these Teets reports as follows:

W. P. Zirkle Farm Mine—No. 658 on Map IV.

On Middle Fork River, 1.4 miles southeast of Swamp Run; **Lower Kittanning Coal**; elevation, 2040′ B.

			Ft.	In.
Sandstone, roof				
Coal	1′	6″		
Slate	0	1		
Coal	1	2		
Slate and sandstone	1	3		
Coal	1	10	5	10
Slate				

The above opening had fallen shut, its section being reported by a resident.

Charles George Farm Mine—No. 659 on Map IV.

On Hooppole Run, 1.2 miles northwest of Yokum; **Middle Kittanning Coal**; elevation, 2075′ B.

			Ft.	In.
Sandstone, roof				
Coal, soft	0′	6″		
Slate	0	1		
Coal	0	2		
Coal, bony	0	5		
Coal	1	10	3	0
Slate, pavement				

D. C. Dunnington Farm Mine—No. 659A on Map IV.

On Middle Fork River, 0.9 mile northeast of Lantz; **Middle Kittanning Coal**; elevation, 2110′ B.

			Ft.	In.
Sandstone, roof			10	0
Coal, soft	2′	1″		
Coal, bony	0	8		
Coal, soft	1	3	4	0
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 659A** in the table of coal analyses at the end of this Chapter.

Okey Harris Farm Mine—No. 660 on Map IV.

On Hooppole Run, 1.2 miles northwest of Yokum; **Middle Kittanning Coal**; butts, N. 89° W.; elevation, 2020′ B.

			Ft.	In.
Sandstone, roof				
Coal, soft	1′	2″		
Slate, dark	0	1		
Coal	0	2		
Shale, slaty	0	7		
Coal, hard	1	1	3	1
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 660** in the table of coal analyses at the end of this Chapter.

Middle and Lower Kittanning Coals, Meade District, Upshur.

In the southeastern portion of Meade District, the Middle and Lower Kittanning Coals have been prospected and mined at numerous points for local domestic use, having much the same character as in Union. The presence of slate and bone partings has retarded their development as commercial coal. Several openings have been made along the waters of French Creek, among which the following were noted:

The **James Brady Heirs Farm Mine (No. 661 on Map IV)**, located on Grandcamp Run, 0.8 mile southeast of Gould, at an elevation of 1440′ B., had fallen shut, but the coal was reported 4 feet thick.

J. C. Brady Farm Mine—No. 662 on Map IV.

On Grandcamp Run, 1 mile southeast of Gould; **Lower Kittanning Coal**; elevation, 1462′ L.

			Ft.	In.
Slate				
Coal	2′	1″		
Coal, bony	0	8		
Coal	2	0	4	9
Slate, pavement				

Charles Perry Farm Mine—No. 663 on Map IV.

On a branch of Grandcamp Run, 1.7 miles south of Gould; Middle and Lower Kittanning Coals; elevation, 1525′ B.

			Ft.	In.
Coal	1′	0″		
Shale, gray	2	0		
Coal, bony	0	10		
Coal, soft	1	0		
Coal, bony	0	4		
Coal, soft	2	0		
Slate	0	10		
Coal, reported	1	0	9	0

Nicholas Linger Farm Mine—No. 664 on Map IV.

On Grandcamp Run, 1.7 miles southeast of Gould; Lower Kittanning Coal; elevation, 1555′ B.

			Ft.	In.
Sandstone, massive			1	0
Coal	1′	8″		
Coal, bony	0	4		
Coal	2	8		
Slate	0	8		
Coal, visible	1	0	6	4
Concealed				

Thornton Crites Farm Mine—No. 665 on Map IV.

On Grandcamp Run, 1.8 miles southeast of Gould; Lower Kittanning Coal; elevation, 1576′ L.

			Ft.	In.
Coal, partly concealed, about	4′	0″		
Slate, dark	1	6		
Coal	0	10		
Slate, black, cannelly	0	8		
Coal, visible	1	6	8	6
Concealed by water				

At the **John Perry Mine (No. 666 on Map IV)**, located on Laurel Fork of French Creek, 1.9 miles south of Gould, both the Middle and Lower Kittanning are exposed at the same opening, separated by 4 feet of shale, the thickness of the former coal being 5′ 3″, and that of the latter 5′ 7″, as shown in detail by the section for Evergreen, page 133. The elevation of the Lower Kittanning at this point is 1447′ L.

George Burr Farm Mine—No. 667 on Map IV.

On Laurel Fork of French Creek, 1.9 miles south of Gould; **Lower Kittanning Coal**; elevation, 1455′ B.

			Ft.	In.
Slate				
Coal, bony	0′	4″		
Coal, soft	2	0		
Coal, bony	0	9		
Coal, soft	1	11	5	0
Slate, pavement				

Samuel Loudin Farm Mine—No. 668 on Map IV.

On Laurel Fork of French Creek, 1 mile north of Evergreen; **Lower Kittanning Coal**; elevation, 1530′ B.

			Ft.	In.
Coal, bony	1′	0″		
Coal, soft	0	11		
Coal, bony	0	4		
Coal, soft	2	0		
Slate, dark	0	8		
Coal	0	8	5	7
Slate, pavement				

Asa Fitzgerald Farm Mine—No. 669 on Map IV.

On Laurel Fork of French Creek, 0.5 mile northeast of Evergreen; **Middle Kittanning Coal**; elevation, 1730′ B.

			Ft.	In.
Slate, black, with coal streaks			2	0
Coal, bony	0′	9″		
Coal, soft	0	11		
Coal, bony	0	5		
Coal, soft	2	1	4	2
Slate, bony				

Floyd Miles Farm Mine—No. 670 on Map IV.

On Laurel Fork of French Creek, at Evergreen; **Lower Kittanning Coal**; elevation, 1760′ B.

			Ft.	In.
Slate				
Coal	1′	1″		
Coal, bony	0	8		
Coal, soft, columnar	2	2	3	11
Slate, black, bony			1	6
Shale, gray				

William S. Harris Farm Mine—No. 671 on Map IV.

On Queens Fork of Laurel Fork of French Creek, 1.7 miles southeast of Evergreen; **Lower Kittanning Coal**; elevation, 1865′ B.

			Ft.	In.
Shale, dark, with streaks of coal			4	0
Coal	0′	9″		
Coal, bony	0	5		
Coal, soft	2	2	3	4
Slate, pavement				

Farm Mine—No. 672 on Map IV.

On Queens Fork, 0.8 mile west of Alton; **Lower Kittanning Coal**; elevation, 1980′ B.

			Ft.	In.
Concealed from **East Lynn Sandstone**			20	0
Shale, dark			5	0
Coal, bony	0′	9″		
Coal, soft	2	8		
Coal, bony	0	8	4	1
Slate, pavement				

John Allman Farm Mine—No. 673 on Map IV.

On Laurel Fork of French Creek, 0.6 mile south of Evergreen; **Middle and Lower Kittanning Coals**; butts, N. 82° E.; elevation, 1830′ B.

					Ft.	In.
1.	**Coal, Middle Kittanning**, visible				2	0
2.	Shale, dark				5	0
3.	**Coal**	1′	6″	**Lower Kittanning**	5	0
4.	**Coal**, bony	0	4			
5.	**Coal**	1	8			
6.	Slate, bony	1	0			
7.	**Coal**	0	6			
8.	Slate pavement, and concealed, to **Homewood Sandstone**				20	0

A sample was collected from Nos. 3 and 5 of section, the composition of which is published under **Mine No. 673** in the table of coal analyses at the end of this Chapter.

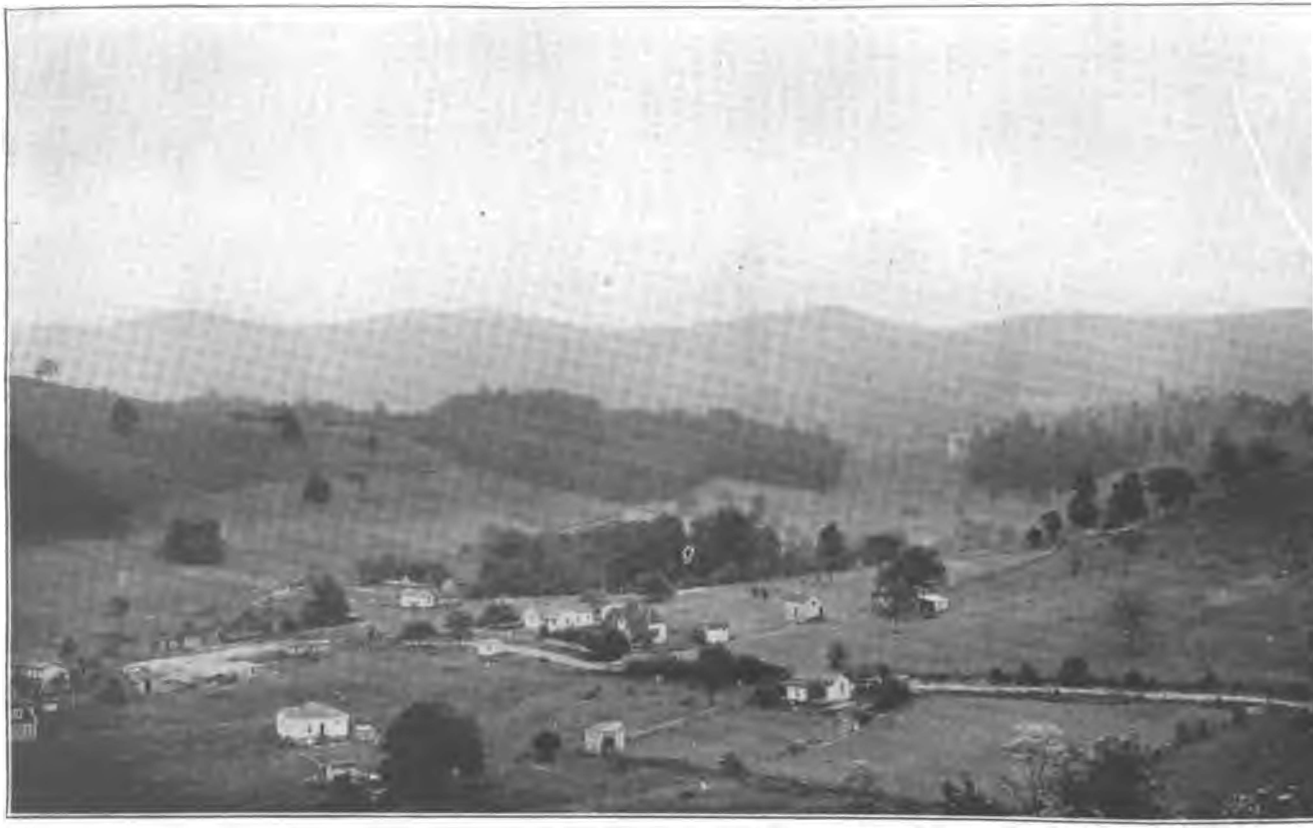

PLATE XXXIV.—View from high point just southwest of Belington, Barbour County, looking northeast and show escarpment of Laurel Ridge (Pottsville Topography) in background, and smooth land made by soft Conemaugh shales in foreground.

Winemiller Brothers Farm Mine—No. 674 on Map IV.

On Laurel Fork of French Creek, 1 mile south of Evergreen; **Lower Kittanning Coal**; elevation, 1860′ B.

			Ft.	In.
Shale, dark				
Coal	0′	3″		
Slate, black	0	6		
Coal	1	8		
Coal, bony	0	5		
Coal, soft	2	2		
Coal, bony	0	7	5	7
Slate, pavement, and concealed			15	0
Sandstone, massive, cliff rock, **Homewood**			50	0

Killingsworth and Marsh Farm Mine—No. 675 on Map IV.

On Seng Run of Laurel Fork of French Creek, 1.8 miles west of Alton; **Middle and Lower Kittanning Coals**; elevation, 1975′ B.

				Ft.	In.
Slate, dark					
Coal, slaty, **Middle Kittanning**				1	6
Shale, dark				4	0
Coal	1′	2″	**Lower Kittanning**	4	0
Slate, bony	0	3			
Coal	2	1			
Coal, bony, visible	0	6			
Concealed to **Homewood Sandstone**					

Worth Reger Farm Mine—No. 676 on Map IV.

On Laurel Fork of French Creek, 2 miles northeast of Holly Grove; **Lower Kittanning Coal**; elevation, 2005′ B.

			Ft.	In.
Sandstone, masive, **East Lynn**				
Coal	2′	6″		
Shale, dark	1	1		
Coal	0	7	4	2
Slate, pavement				

On the Buckhannon River, the Lower Kittanning Coal appears above drainage near the village of Sago, and rising southward at a more rapid rate than the river, gradually approaches the top of the hills at the south end of the District near Alexander. According to Teets, the coal was once opened at the **George Burner Heirs Farm Mine (No. 677 on Map IV)**, where it has an elevation of 1446′ L., the mine being abandoned and no measurement obtainable.

Peter S. Engle Farm Mine—No. 678 on Map IV.

On Sawmill Run of Buckhannon River, 0.3 mile west of Ours Mill; Lower Kittanning Coal; elevation, 1520' B.

			Ft.	In.
Fire clay, visible			3	0
Slate, dark			2	0
Coal, soft	1'	9"		
Coal, bony	0	7		
Coal, soft	2	2	4	6
Slate, pavement				

Peter S. Engle Farm Mine—No. 679 on Map IV.

On the Buckhannon River, 0.2 mile northwest of Ours Mill; Lower Kittanning Coal; elevation, 1534' B.

			Ft.	In.
Slate, black, cannelly			0	8
Coal, soft	1'	2"		
Coal, bony	0	9		
Coal, soft	1	9	3	8
Slate, pavement				

J. S. Hamilton Farm Mine—No. 680 on Map IV.

On the Buckhannon River, 0.3 mile south of Ours Mill; Lower Kittanning Coal; elevation, 1565' B.

			Ft.	In.
Slate, black			2	0
Coal, soft	0'	10"		
Coal, bony	0	4		
Coal, soft	2	0	3	2
Slate, pavement				

The following opening is reported by Teets in the same locality:

John M. Tenney Farm Mine—No. 681 on Map IV.

On the Buckhannon River, 0.3 mile southeast of Ours Mill; Lower Kittanning Coal; butts, east and west; elevation, 1550' B.

			Ft.	In.
Slate, black, cannel			3	0
Coal, soft	3'	5"		
Slate	0	4		
Coal, bony	0	5		
Coal, visible	1	5	5	7

Joseph Mouse Farm Mine—No. 682 on Map IV.

On the Buckhannon River, 0.8 mile southeast of Ours Mill; **Lower Kittanning Coal**; elevation, 1595′ B.

			Ft.	In.
Sandstone, massive				
Slate, bony			2	0
Coal, soft	1′	1″		
Coal, bony	0	8		
Coal, bony	2	1	3	10
Slate, pavement				

The following opening is reported by Teets:

Howard Rowan Farm Mine—No. 683 on Map IV.

On the Buckhannon River, 1.2 miles northwest of Tenmile; **Lower Kittanning Coal**; elevation, 1645′ B.

			Ft.	In.
Slate				
Coal, bony	0′	11″		
Coal, medium-hard	2	4		
Slate	0	1		
Coal	0	4		
Coal, bony	0	10		
Coal, soft	2	0	6	6
Slate				

A sample was collected from this opening, the composition of which is published under **Mine No. 683** in the table of coal analyses at the end of this Chapter.

William Scott Farm Mine—No. 684 on Map IV.

On the Buckhannon River, 0.8 mile northwest of Tenmile; **Lower Kittanning Coal**; elevation, 1660′ B.

			Ft.	In.
Coal	0′	10″		
Slate, black, bony	3	0		
Coal, soft	1	0		
Coal, bony	0	6		
Coal, visible	1	6	6	10
Concealed by water				

The Lower Kittanning was once opened and mined locally at the **Eckess Farm Mine (No. 685 on Map IV)**, on the Buckhannon River, 0.4 mile west of Tenmile, at an elevation of

1700′ B., but the place has now fallen shut. As described by Dr. White in Volume II(A), page 520, a sample was once collected from this mine by Mr. P. Queen, the analysis of which, as made by Hite and Patton, is as follows:

Proximate.	Per cent.	**Ultimate.**	Per cent.
Moisture	0.60	**Carbon**	73.91
Volatile Matter	31.60	**Hydrogen**	4.64
Fixed Carbon	56.18	**Oxygen**	7.76
Ash	11.62	**Nitrogen**	1.32
		Sulphur	0.75
Total	100.00	**Ash**	11.62
Sulphur	1.20	**Total**	100.00
Phosphorus	0.011	**Calorimeter B. T. U.**	13,432
		Calculated B. T. U.	13,055

Just north of Imperial, the coal was once opened at the **Hiram Bean Farm Mine (No. 686 on Map IV)**, at an elevation of 1835′ B., but the place had fallen almost entirely shut, about 4 feet of coal being visible at the mouth of the opening.

At the **Imperial Sand Company Coal Mine (No. 687 on Map IV)**, located on the Buckhannon River at Imperial, the coal is mined for use at the sand works of this company, being 5′ 8″, with partings, as given in detail in the section for Imperial, page 136. A sample was collected from this opening by Teets, the composition of which is published under **Mine No. 687** in the table of coal analyses at the end of this Chapter. The following section was secured by Teets at an abandoned opening near Beans Mill:

W. W. Wyatt Farm Mine—No. 688 on Map IV.

On the Buckhannon River, just west of Beans Mill; Lower Kittanning Coal; elevation, 1975′ B.

			Ft.	In.
Slate				
Coal, soft	2′	1″		
Coal, bony	0	8		
Coal	1	0		
Slate, black	0	0½		
Coal, soft	1	6		
Coal, soft, reported	2	0	7	3½

G. W. Fish Farm Mine—No. 689 on Map IV.

On the Buckhannon River, just northwest of Alton; Lower Kitt ning Coal; elevation, 1970′ B.

			Ft.	In.
Sandstone, massive, East Lynn			40	0
Concealed and shale			15	0
Coal, bony	0′	6″		
Coal, soft	2	8		
Slate, bony	1	0		
Coal	1	6	5	8
Concealed by water and mud				

Since field work was completed, this mine has been org ized on a commercial basis under the name of **Hays C Company**, according to Earl A. Henry, Chief of the West V ginia Department of Mines.

Farm Mine—No. 690 on Map IV.

On a branch of Big Run of Buckhannon River, 0.7 mile southw of Alton; Lower Kittanning Coal; elevation, 2010′ B.

			Ft.	In.
Slate, black				
Coal	0′	10″		
Bone	0	1		
Coal	2	4	3	3
Slate, pavement				

The **William Hosaflook Farm Mine (No. 691 on Map I** located on Big Run, 1.7 miles southwest of Alton, at an ele tion of 2050′ B., had partly fallen shut, but showed abou feet of coal above the water. The **Arthur Gladwell Fa Mine (No. 692 on Map IV)**, located on the Buckhannon Riv 0.2 mile south of Alton, at an elevation of 2015′ B., had fall partly shut, 4 to 5 feet of coal being visible.

Okey Gould Farm Mine—No. 693 on Map IV.

On the Buckhannon River, 0.9 mile south of Alton; Lower Kitt ning Coal; butts, N. 86° W.; elevation, 2065′ B.

			Ft.	In.
Slate, roof				
Coal	2′	1″		
Coal, bony	0	8		
Coal	1	0		

			Ft.	In.
Slate, black	0'	0½"		
Coal, soft	1	6		
Coal, reported	2	0	7	3½

The **Jesse Pringle Farm Mine (No. 694 on Map IV)**, located on Simmons Run, 0.5 mile northwest of Alexander, at an elevation of 2100' B., measured a total of 4' 1", as given in detail in the section for Alexander, page 137. A sample was collected from this opening, the composition of which is published under **Mine No. 694** in the table of coal analyses at the end of this Chapter.

Middle and Lower Kittanning Coals, Washington District, Upshur.

In Washington District, the Middle and Lower Kittanning have much the same appearance and quality as in Union, usually forming one seam that can be mined as a unit, but sometimes separating into two distinct beds, and both seams having numerous slate or bone partings.

Several openings have been made along the waters of Sand Run, the two following being reported by Teets:

M. M. Miller Farm Mine—No. 695 on Map IV.

On a branch of Sand Run, 1 mile northeast of Goodwin; Lower Kittanning Coal; elevation, 1675' B.

			Ft.	In.
Slate, dark, cannelly			4	0
Coal, soft	1'	2"		
Coal, bony	1	3		
Coal, soft	1	5	3	10
Slate, pavement				

E. J. Miller Farm Mine—No. 696 on Map IV.

On a branch of Sand Run, 0.4 mile north of Goodwin; Lower Kittanning Coal; elevation, 1654' L.

			Ft.	In.
Slate				
Coal, soft	1'	1"		
Coal, bony	1	0		
Coal, soft	1	7	3	8
Slate, pavement				

Coal and Coke Railway Mine—No. 697 on Map IV.

On Sand Run, 0.3 mile east of Goodwin; **Lower Kittanning Coal**; elevation, 1754′ L.

			Ft.	In.
Sandstone, massive, **East Lynn**				
Coal, bony	1′	5″		
Coal, soft	2	1	3	6
Fire clay				

The six following openings were noted by Teets along the same branch of Sand Run:

C. G. Benson Farm Mine—No. 698 on Map IV.

On a branch of Sand Run, 1.4 miles east of Tallmansville; **Lower Kittanning Coal**; elevation, 1785′ B.

			Ft.	In.
Slate				
Coal, soft	1′	3″		
Coal, bony	1	0		
Coal, soft	1	8	3	11
Slate, pavement				

J. H. Shipman Farm Mine—No. 699 on May IV.

On a branch of Sand Run, 1.2 miles southeast of Tallmansville; **Lower Kittanning Coal**; elevation, 1810′ B.

			Ft.	In.
Slate				
Coal, soft	1′	3″		
Coal, bony	0	11		
Coal, soft	1	9	3	11
Slate, pavement				

Anthony Hornbeck Farm Mine—No. 700 on Map IV.

On a branch of Sand Run, 1.2 miles southeast of Tallmansville; **Lower Kittanning Coal**; elevation, 1825′ B.

			Ft.	In.
Slate				
Coal, soft	1′	8″		
Coal, bony	0	10		
Coal, soft	1	6	4	0
Slate, pavement				

A. H. Benson Farm Mine—No. 701 on Map IV.

On a branch of Sand Run, 1.5 miles west of Kedron; Lower Kittanning Coal; elevation, 1878′ L.

			Ft.	In.
Slate, roof				
Coal, soft	1′	6″		
Coal, bony	1	0		
Coal, soft	1	5	3	11

W. W. Tallman Farm Mine—No. 702 on Map IV.

On a branch of Sand Run, 1 mile west of Kedron; Lower Kittanning Coal; elevation, 1940′ B.

			Ft.	In.
Slate				
Coal, bony	0′	10″		
Coal, soft	2	6		
Slate	1	4		
Coal, hard	1	6	6	2
Slate, pavement				

A. T. Tallman Farm Mine—No. 703 on Map IV.

On a branch of Sand Run, 1.3 miles northwest of Kedron; Middle Kittanning Coal; elevation, 1930′ B.

			Ft.	In.
Sandstone, massive roof			15	0
Coal, soft	1′	0″		
Coal, bony	1	0		
Coal, soft	1	11	3	11
Slate, pavement				

The three following openings, examined by Teets, are located on another branch of Sand Run, farther east:

Bun Shipman Farm Mine—No. 704 on Map IV.

On a branch of Sand Run, 1.2 miles west of Sand Run Station; Middle Kittanning Coal; elevation, 1800′ B.

	Ft.	In.
Sandstone		
Coal, croppy	3	7
Slate		

"Mine opening not under to good cover."

Lyda Light Farm Mine—No. 705 on Map IV.

On a branch of Sand Run, 1.5 miles north of Kedron; Lower Kittanning Coal; elevation, 1930′ B.

			Ft.	In.
Slate				
Coal, soft	1′	0″		
Slate	0	3		
Coal	0	3		
Slate	0	5		
Coal	0	6		
Coal, bony	0	4		
Coal	1	4	4	1

S. N. Tenney Farm Mine—No. 706 on Map IV.

On a branch of Sand Run, 1 mile north of Kedron; Lower Kittanning Coal; elevation, 2010′ B.

			Ft.	In.
Slate				
Coal	0′	4″		
Slate	0	2		
Coal	0	9		
Slate	0	11		
Coal, soft	1	6	3	8

The three following openings are located on another branch of Sand Run, near the Coal and Coke Railway:

Sanford Light Farm Mine—No. 707 on Map IV.

On Sand Run, 1 mile west of Sand Run Station; Lower Kittanning Coal; elevation, 1850′ B.

			Ft.	In.
Slate, dark, with streaks of coal			2	0
Coal, slaty	0′	7″		
Shale, gray	0	9		
Coal, good	2	8	4	0
Coal, bony, thickness concealed by water				

Coal and Coke Railway Coal Exposure—No. 708 on Map IV.

On Sand Run, 0.5 mile west of Sand Run Station; Lower Kittanning Coal; elevation, 1900′ B.

			Ft.	In.
Slate, black			2	0
Coal	0′	10″		
Slate, black, bony	1	6		

		Ft.	In.
Coal	1′ 10″	4	2
Slate, pavement			

The Middle and Lower Kittanning are both visible at the **Coal and Coke Railway Exposure (No. 709 on Map IV)**, on Sand Run, at the west portal of the Sand Run tunnel, just east of Sand Run Station, where they are separated by 16 feet of shale and slate, the former seam being 4′ 0″ thick, and the latter 4′ 2″, with partings, as shown in detail in the section for Sand Run, page 140.

On the Buckhannon River and its waters above Sago, numerous openings have been made in the Kittannings, the following being noted near the point where the coal rises from the river:

Willis Norvell Farm Mine—No. 710 on Map IV.

On the Buckhannon River, at Sago; Lower Kittanning Coal; elevation, 1455′ B.

			Ft.	In.
Sandstone, massive				
Slate			0	6
Coal	1′	0″		
Slate, black	0	1		
Coal	0	3		
Slate, black	0	1		
Coal	1	7	3	0
Slate, pavement				

Coal and Coke Railway Prospect—No. 711 on Map IV.

On the Buckhannon River, 0.5 mile northwest of Ours Mill; Lower Kittanning Coal; elevation, 1500′ B.

			Ft.	In.
Shale, gray				
Slate, bony			1	0
Coal	2′	1″		
Coal, bony	0	9		
Coal	1	6	4	4
Slate, pavement				

The following mine was opened soon after the construction of the Coal and Coke Railway and operated on a commercial basis, but has been abandoned:

Coal and Coke Railway Mine—No. 712 on Map IV.

On Grassy Run, 1.1 miles southwest of Tallmansville; L Kittanning Coal; elevation, 1610' B.

			Ft.	In.
Shale, dark				
Coal, hard	2'	10"		
Coal, bony	0	10		
Coal, soft, columnar	2	2	5	10
Slate, pavement				

F. A. Reed Farm Mine—No. 713 on Map IV.

On Grassy Run, 0.3 mile southeast of Tallmansville; Lower tanning Coal; elevation, 1650' B.

			Ft.	In.
Shale, sandy			5	0
Coal	1'	9"		
Coal, bony	0	5		
Coal, soft, columnar	2	3	4	5
Slate, pavement				

The following opening is reported by Teets, farthe the same branch:

Leon Gaston Farm Mine—No. 714 on Map IV.

On a branch of Grassy Run, 0.8 mile southeast of Tallmans Lower Kittanning Coal; elevation, 1760' B.

			Ft.	In.
Sandstone, massive, East Lynn			8	0
Slate, black			3	0
Coal, soft	1'	9"		
Coal, bony	1	0		
Coal, soft	1	3	4	0
Slate, pavement				

The **Alfred Debarr Farm Mine (No. 715 on Map** located on the Buckhannon River, 0.3 mile east of Ten at an elevation of 1697' L., measured a total of 3' 9", as g in detail in the section for Tenmile, page 138.

Numerous other openings in the southern end of District, as observed by Teets, are given on the follo pages. Nos. 716-729, inclusive, are located on the water Tenmile Creek.

Drusilla Tenney Farm Mine—No. 716 on Map IV.

On Tenmile Creek, 0.5 mile southeast of Tenmile; **Middle and Lower Kittanning Coals**; elevation, 1810′ B.

				Ft.	In.
Shale					
Coal	3′	0″	Middle		
Slate	3	0	Kittanning	6	5
Coal	0	5			
Slate				4	0
Coal, hard	1′	0″			
Coal, soft	2	0			
Slate, dark	1	2			
Coal	0	5			
Slate, black, bony	0	5	Lower		
Coal, soft	1	1	Kittanning	6	1
Slate, pavement					

Daniel Snyder Farm Mine—No. 717 on Map IV.

On Tenmile Creek, 1 mile southeast of Tenmile; **Middle Kittanning Coal**; elevation, 1865′ B.

			Ft.	In.
Slate				
Coal, soft	1′	3″		
Coal, bony	1	0		
Coal, soft	2	2	4	5
Slate, pavement				

Roscoe King Farm Mine—No. 718 on Map IV.

On Tenmile Creek, 1.5 miles east of Tenmile; **Lower Kittanning Coal**; elevation, 1860′ B.

			Ft.	In.
Slate, black, visible			3	0
Coal, soft	3′	3″		
Slate, black	0	1		
Coal	0	3		
Slate	0	2		
Coal, bony	0	4		
Coal, soft	2	6	6	7
Slate, pavement				

James Tenney Farm Mine—No. 719 on Map IV.

On Tenmile Creek, 1.5 miles east of Tenmile; **Lower Kittanning Coal**; elevation, 1855′ B.

			Ft.	In.
Slate				
Coal	3′	0″		
Slate	0	2		
Coal	0	2		
Slate	0	4		
Coal, bony	0	4		
Coal	2	4	6	4
Slate, pavement				

Silas Goodwin Farm Mine—No. 720 on Map IV.

On Tenmile Creek, 2.3 miles east of Tenmile; **Lower Kittanning Coal**; elevation, 2056′ L.

			Ft.	In.
Slate				
Coal, bony	0′	6″		
Coal, soft	2	5		
Slate, dark	0	10		
Coal	0	7		
Slate, gray	0	2		
Coal, soft	1	5	5	11
Slate, pavement				

Bee Squires Farm Mine—No. 721 on Map IV.

On Tenmile Creek, 0.8 mile southwest of Queen; **Lower Kittanning Coal**; elevation, 2255′ B.

			Ft.	In.
Slate				
Coal	2′	4″		
Coal, bony	0	9		
Coal, soft	1	1	4	2
Slate, pavement				

Ernest Wamsley Farm Mine—No. 722 on Map IV.

On Tenmile Creek, 0.8 mile southwest of Queen; **Middle Kittanning Coal**; elevation, 2275′ B.

			Ft.	In.
Sandstone, roof				
Coal, soft	2′	4″		
Coal, bony	0	8		
Coal	1	8	4	8
Slate, pavement				

S. M. Tenney Farm Mine—No. 723 on Map IV.

On Right Fork of Tenmile Creek, 1.1 miles south of Tenmile; **Middle Kittanning Coal**; elevation, 1850′ B.

			Ft.	In.
Coal, soft	1′	2″		
Coal, bony	1	0		
Coal, soft	2	3	4	5
Slate				

A. W. Tenney Farm Mine—No. 724 on Map IV.

On a branch of Right Fork of Tenmile Creek, 1.6 miles southeast of Tenmile; **Lower Kittanning Coal**; elevation, 2000′ B.

			Ft.	In.
Shale, slaty				
Coal,	0′	10″		
Slate	4	0		
Coal	2	3		
Slate	0	1		
Coal	0	8	7	10
Slate, pavement				

Alonzo Kelley Farm Mine—No. 725 on Map IV.

On Right Fork of Tenmile Creek, 1.9 miles northeast of Beans Mill; **Lower Kittanning Coal**; elevation, 2070′ B.

			Ft.	In
Slate				
Coal, bony	0′	8″		
Coal, soft	2	4		
Slate	0	4		
Coal	0	9		
Shale, slaty	0	8		
Coal, soft	2	1	6	10
Slate, pavement				

Charles Wilfong Farm Mine—No. 726 on Map IV.

On a branch of Right Fork of Tenmile Creek, 1.5 miles southwest of Queen; **Lower Kittanning Coal**; elevation, 2135′ B.

			Ft.	In.
Slate				
Coal, soft	2′	10″		
Slate	0	2		
Coal	0	7		
Slate	0	6		
Coal	0	7	4	8
Slate, pavement				

Sylvester Tenney Farm Mine—No. 727 on Map IV.

On a branch of Right Fork of Tenmile Creek, 1.6 miles southwest of Queen; **Lower Kittanning Coal**; elevation, 2205′ B.

			Ft.	In.
Sandstone				
Slate, dark, visible			4	0
Coal, soft	2′	7″		
Shale, slaty	1	0		
Coal	1	2	4	9
Slate, pavement				

John Cutright Farm Mine—No. 728 on Map IV.

On Right Fork of Tenmile Creek, 1.3 miles southeast of Beans Mill; **Lower Kittanning Coal**; elevation, 2105′ B.

			Ft.	In.
Slate				
Coal, bony	0′	9″		
Coal, soft	3	4		
Shale, gray	0	8		
Coal, soft	2	8	7	5
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 728** in the table of coal analyses at the end of this Chapter.

William Nicholas Farm Mine—No. 729 on Map IV.

On Right Fork of Tenmile Creek, 1.3 miles southeast of Beans Mill; **Lower Kittanning Coal**; elevation, 2250′ B.

			Ft.	In.
Sandstone, hard				
Coal	2′	8″		
Coal, bony	0	10		
Coal	2	2	5	8
Slate, pavement				

Louis Bennett Farm Mine—No. 730 on Map IV.

On the Buckhannon River, 0.4 mile southeast of Imperial; **Lower Kittanning Coal**; elevation, 1895′ B.

			Ft.	In.
Slate, black, cannelly, visible			4	0
Coal, bony	0′	10″		
Coal, soft	2	9		
Slate, gray	0	4		

			Ft.	In.
Coal	0'	9"		
Slate, gray	0	5		
Coal	0	5		
Coal, bony	0	4		
Coal, soft	1	6	7	4
Slate, pavement				

The four following openings are on Panther Fork:

Parley Queen Farm Mine—No. 731 on Map IV.

On Panther Fork, 0.7 mile southeast of Beans Mill; Lower Kittanning Coal; elevation, 2045' B.

			Ft.	In.
Slate				
Coal, bony	0'	8"		
Coal, softer	2	0		
Shale, gray	1	0		
Coal	1	6	5	2
Slate, pavement				

Andrew Harmon Farm Mine—No. 732 on Map IV.

On Panther Fork, 0.9 mile southeast of Beans Mill; Lower Kittanning Coal; elevation, 2060' B.

			Ft.	In.
Slate				
Coal, bony	0'	6"		
Coal, softer	2	2		
Shale, gray	0	11		
Coal, soft, visible	1	1	4	8

William Blume Farm Mine—No. 733 on Map IV.

On a branch of Panther Fork, 1.7 miles southeast of Beans Mill; Lower Kittanning Coal; elevation, 2300' B.

			Ft.	In.
Sandstone, massive, East Lynn			15	0
Coal, hard	2'	9"		
Coal, bony	0	10		
Coal	2	2	5	9
Slate				

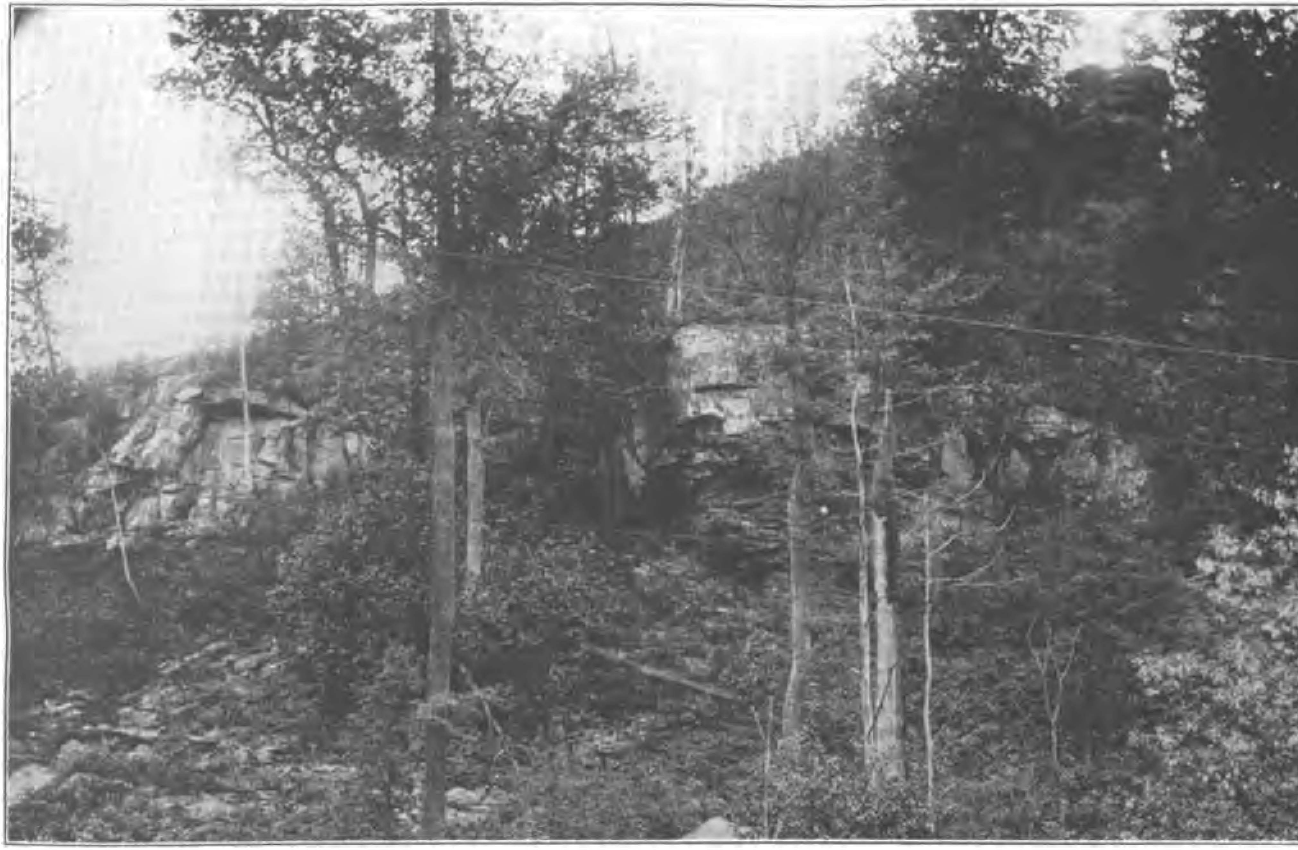

PLATE XXXV.—Homewood Sandstone (above) and Upper Connoquenessing Sandstone (below) outcropping along Ty
Valley River in Randolph County just southeast of Laurel Station; Topography of Pottsville Series.

John Zickefoose Farm Mine—No. 734 on Map IV.

On a branch of Panther Fork, 2 miles southeast of Beans Mill; Lower Kittanning Coal; elevation, 2300′ B.

			Ft.	In.
Sandstone				
Coal, hard	2′	8″		
Coal, bony	0	10		
Coal, soft	2	2	5	8
Slate, pavement				

R. B. Cody Farm Mine—No. 735 on Map IV.

On the Buckhannon River, 0.8 mile southeast of Alton; Lower Kittanning Coal; elevation, 2070′ B.

			Ft.	In.
Slate				
Coal	2′	3″		
Shale	0	10		
Coal, visible	0	10	3	11

Robert Johns Farm Mine—No. 736 on Map IV.

On Swamp Run of Buckhannon River, 0.8 mile northwest of Stockerts; Lower Kittanning Coal; elevation, 2255′ B.

			Ft.	In.
Slate				
Coal, hard	2′	0″		
Shale	0	11		
Coal	1	3	4	2

The Jacob Queen Farm Mine (No. 737 on Map IV), located on Herods Run, 0.6 mile southwest of Stockerts, at an elevation of 2370′ B., measured a total thickness of 5′ 7″, as given in detail in the section for Stockerts, page 139.

Several openings have been made in Washington District on the waters of Middle Fork River, of which Teets has noted the following:

Sheridan Hinkle Farm Mine—No. 738 on Map IV.

On Gum Run of Middle Fork River, 0.8 mile northwest of Gale; Middle Kittanning Coal; elevation, 2085′ B.

			Ft.	In.
Slate				
Coal, soft	1′	1″		
Coal, bony	1	0		
Coal, soft	2	1	4	2
Slate, pavement				

Warwick Osborne Farm Mine—No. 739 on Map IV.

On Gum Run of Middle Fork River, 1.2 miles west of Gale; Middle Kittanning Coal; elevation, 2075′ B.

			Ft.	In.
Slate				
Coal, soft	1′	0″		
Coal, bony	0	11		
Coal, soft	2	3	4	2
Slate, pavement, and concealed, to Lower Kittanning Coal			20	0

Alvin Osborne Heirs Farm Mine—No. 740 on Map IV.

On a branch of Middle Fork River, 0.5 mile north of Kedron; Lower Kittanning Coal; elevation, 2095′ B.

			Ft.	In.
Slate, black, visible			2	0
Coal	0′	8″		
Slate	0	11		
Coal	0	6		
Slate	0	3		
Coal, soft	2	4	4	8
Slate, pavement				

The Middle Kittanning is opened only 15 feet above the preceding mine and shows the following structure:

J. A. Goodwin Farm Mine—No. 741 on Map IV.

On a branch of Middle Fork River, 0.5 mile north the Kedron; Middle Kittanning Coal; elevation, 2110′ B.

			Ft.	In.
Slate, roof				
Coal, soft	1′	2″		
Coal, bony	0	8		

Digiti

			Ft.	In.
Coal, soft	2′	1″	3	11
Slate, pavement				

W. W. Tallman Farm Mine—No. 742 on Map IV.

On Laurel Run of Middle Fork River, 0.7 mile southwest of Kedron; Middle Kittanning Coal; elevation, 2040′ B.

			Ft.	In.
Slate				
Coal, soft	1′	3″		
Coal, bony	0	8		
Coal, soft	2	0	3	11
Slate				

Emanuel Goodwin Farm Mine—No. 743 on Map IV.

On Laurel Run of Middle Fork River, 1.1 miles northwest of Queen; Middle Kittanning Coal; elevation, 2130′ B.

			Ft.	In.
Slate, roof				
Coal, soft	1′	4″		
Coal, bony	0	10		
Coal, soft	2	1	4	3
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 743** in the table of coal analyses at the end of this Chapter.

A. L. Hinkle Farm Mine—No. 744 on Map IV.

On a branch of Leonard Run of Middle Fork River, 1.4 miles southwest of Queen; Middle Kittanning Coal; elevation, 2260′ B.

			Ft.	In.
Slate				
Coal, soft	2′	2″		
Coal, bony	1	4		
Coal, soft	1	4	4	10
Slate, pavement				

Theodore Clark Farm Mine—No. 745 on Map IV.

On Leonard Run of Middle Fork River, 0.7 mile north of Ash Camp; Lower Kittanning Coal; elevation, 2310′ B.

			Ft.	In.
Slate, roof				
Coal	2′	1″		
Coal, bony	0	10		
Coal	1	8	4	7
Slate, pavement				

P. A. Reeder Farm Mine—No. 746 on Map IV.

On Right Fork of Middle Fork River, 0.4 mile northeast of Ash Camp; Lower Kittanning Coal; elevation, 2440′ B.

			Ft.	In.
Sandstone, massive, coarse, East Lynn			10	0
Coal, splint	2′	9″		
Coal, bony	0	10		
Coal, soft	1	9	5	4
Slate, pavement				

Charles Anderson Farm Mine—No. 747 on Map IV.

On Right Fork of Middle Fork River, at Ash Camp; Lower Kittanning Coal; elevation, 2410′ B.

			Ft.	In.
Sandstone, roof				
Coal, soft	1′	10″		
Coal, bony	1	1		
Coal, soft	2	1	5	0
Slate, pavement				

Middle and Lower Kittanning Coals, Banks District, Upshur

In Banks District, the Middle and Lower Kittanning have been opened and mined for local use at many points and show much the same character as in Meade, Union, and Washington. The coal is uniformly low in sulphur, but contains many slate partings that must be removed when mining.

The following opening apparently represents both the Middle and Lower seams:

Columbus Crites Farm Mine—No. 748 on Map IV.

On Alec Run of Buckhannon River, 2 miles northwest of Selbyville; **Middle and Lower Kittanning Coals**; elevation, 2220′ B.

	Ft.	In.
Sandstone, massive, **East Lynn**		
Concealed	10	0
Slate, black	6	0
Coal, Middle Kittanning	1	5
Slate, gray	8	6
Coal, Lower Kittanning	2	7
Slate, pavement, and concealed	5	0
Sandstone, massive, great cliff, **Homewood**	40	0

The outcrop of the Kittannings in Banks District is mostly on the headwaters of the Little Kanawha River, numerous openings having been made along its branches, of which the following were noted:

Evan McCartney Farm Mine—No. 749 on Map IV.

On Trace Run of Little Kanawha River, 1.1 miles southeast of Ingo; **Lower Kittanning Coal**; elevation, 1550′ B.

			Ft.	In.
Sandstone, shaly			1	0
Slate, black			1	0
Coal	0′	5″		
Slate, black, soft	0	4		
Coal, soft	1	10		
Coal, bony	0	7		
Slate, dark	0	6		
Coal, soft	0	11		
Coal, bony	1	6	6	1
Slate, pavement				

Charles Rexroad Farm Mine—No. 750 on Map IV.

On Cherry Fork of Little Kanawha, 1.3 miles northeast of Ingo; **Lower Kittanning Coal**; elevation, 1505′ B.

			Ft.	In.
Shale, sandy				
Coal, bony	0′	8″		
Coal, good	0	5		
Slate, black	0	1		
Coal, somewhat bony	1	0		
Slate, black, 0′ 1″ to	0	3		
Coal, good	2	3	4	8
Slate, pavement				

Lee Harris Farm Mine—No. 751 on Map IV.

On Panther Fork of Little Kanawha River, 1.2 miles northeast of Ingo; Lower Kittanning Coal; elevation, 1545′ B.

			Ft.	In.
Slate, gray				
Slate, black			0	6
Coal	1′	1″		
Coal, bony	1	0		
Slate, black	0	3		
Coal	2	11	5	3
Shale, gray, pavement, visible			2	0

J. A. Bragg Farm Mine—No. 752 on Map IV.

On Panther Fork of Little Kanawha River, 1.7 miles northeast of Ingo; Lower Kittanning Coal; elevation, 1615′ B.

			Ft.	In.
Slate, black				
Coal, soft	0′	8″		
Coal, bony	0	4		
Coal, soft	0	4		
Slate, dark	0	2		
Coal, soft	1	10	3	4
Slate, pavement				

Charity Riley Farm Mine—No. 753 on Map IV.

On Cave Run of Little Kanawha River, 1 mile southwest of Kanawha Head; Lower Kittanning Coal; elevation, 1735′ B.

			Ft.	In.
Sandstone, massive				
Slate, black			1	0
Coal	0′	5″		
Slate, black, soft	0	3		
Coal	2	5	3	1
Concealed by water				

The coal was reported to have shown a total thickness of 6 feet at the above opening.

Benjamin Curry Farm Mine—No. 754 on Map IV.

On Little Kanawha River, 0.7 mile west of Kanawha Head; Lower Kittanning Coal; elevation, 1722′ B.

	Ft.	In.
Sandstone, massive	6	0
Shale, dark	2	0

			Ft.	In.
Coal, bony	0′	11″		
Coal, good	1	3		
Slate	0	3		
Coal	2	0	4	5
Slate, pavement, concealed, etc., to base of Upper Mercer Coal			77	0

Farm Mine—No. 755 on Map IV.

On Lynncamp Run of Little Kanawha, 0.5 mile southeast of Kanawha Head; Lower Kittanning Coal; elevation, 1760′ B.

			Ft.	In.
Slate, black				
Coal, soft	2′	9″		
Coal, bony	2	4		
Coal, soft	1	8	6	9
Slate, pavement				

At **Farm Mine No. 756 on Map IV**, on Lynncamp Run, 0.5 mile southeast of Kanawha Head, the Middle Kittanning was once mined at an elevation of 1795′ B., and 35 feet above the Lower Kittanning. The place has now fallen shut, only 2 feet of coal being visible at the mine mouth.

The Lower Kittanning was once mined at the **Ralph Teter Farm Mine (No. 757 on Map IV)**, located on the Little Kanawha, 0.3 mile west of Arlington, at an elevation of 1570′ B., about 4 feet of coal being visible. The Middle Kittanning has been mined in the hill just above this opening, the interval between the two coals being 25 feet, and shows the following section:

Ralph Teter Farm Mine—No. 758 on Map IV.

On the Little Kanawha River, 0.4 mile west of Arlington; Middle Kittanning Coal; elevation, 1595′ B.

			Ft.	In.
Sandstone			2	0
Shale, sandy			2	0
Slate, black, cannelly			2	0
Coal, soft	0′	6″		
Bone	0	10		
Coal, soft	1	0		
Coal, bony	0	3		
Coal, soft	1	3	3	10
Slate, pavement				

George Fidler Farm Mine—No. 759 on Map IV.

On the north side of Little Kanawha River, at Arlington; Middle Kittanning Coal; butts, N. 87° W.; elevation, 1615′ B.

				Ft.	In.
1.	Slate, black			2	0
2.	Coal	0′	6″		
3.	Bone	1	0		
4.	Coal	0	4		
5.	Bone	0	3		
6.	Coal	2	4	4	5
7.	Slate, pavement, and concealed, to Homewood Sandstone			20	0

A sample was collected from No. 6 of section, the composition of which is published under **Mine No. 759** in the table of coal analyses at the end of this Chapter.

Fidler Farm Mine—No. 760 on Map IV.

On the south side of Little Kanawha River, 0.2 mile southeast of Arlington; Middle Kittanning Coal; elevation, 1645′ B.

			Ft.	In.
Sandstone, massive			5	0
Coal	0′	5″		
Bone	0	3		
Coal	0	9		
Bone	0	4		
Coal	1	9	3	11
Slate, pavement				

The **Fidler Farm Mine (No. 761 on Map IV)**, located on the south side of the Kanawha, 0.3 mile southeast of Arlington, at an elevation of 1645′ B., measured a total of 4′ 11″, as published in detail in the section for Arlington, page 148. **Farm Mine No. 762 on Map IV**, located on a branch of Laurel Run of Little Kanawha, 1 mile northeast of Arlington, at an elevation of 1670′ B., had been abandoned, but showed about 4 feet of Lower Kittanning Coal.

Bert Robey Farm Mine—No. 763 on Map IV.

On a branch of Laurel Run of Little Kanawha River, 1.2 miles east of Arlington; Lower Kittanning Coal; elevation, 1675′ B.

			Ft.	In.
Slate, black, sandy			1	0
Coal	1′	4″		
Bone	0	5		
Coal	1	2		
Bone	0	4		
Coal	1	0	4	3
Slate, pavement				

The blossom of the Middle Kittanning shows at this point at a spring 25 feet above the Robey Opening, but has not been prospected.

E. C. Young Farm Mine—No. 764 on Map IV.

On Laurel Run of Little Kanawha River, at Gaines; Lower Kittanning Coal; elevation, 1805′ B.

			Ft.	In.
Shale, sandy			10	0
Slate, black			2	0
Coal, soft	0′	5″		
Coal, hard	0	6		
Coal, soft	1	10		
Slate, bony	0	2		
Coal	1	3	4	2
Slate, pavement				

William J. Fidler Farm Mine—No. 765 on Map IV.

On the Little Kanawha River, 0.3 mile northeast of Arlington; Middle Kittanning Coal; elevation, 1595′ B.

			Ft.	In.
Shale, dark, sandy			1	0
Slate, black, cannel			1	0
Coal, soft	0′	9″		
Coal, bony	0	3		
Coal	1	3		
Coal, bony	0	3		
Coal, soft	1	7	4	1
Slate, pavement				

Both the Middle and Lower Kittanning are opened at the following locality where the interval from the base of the Lower to the base of Middle is 28 feet:

George Fidler Farm Mine—No. 766 on Map IV.

On the Little Kanawha River, 0.7 mile northeast of Arlington; Lower Kittanning Coal; butts, N. 86° W.; elevation, 1570′ B.

			Ft.	In.
Shale, sandy			3	0
Coal, soft	1′	1″		
Shale, gray	0	7		
Slate, bony	0	10		
Coal, soft	0	11		
Coal, bony	0	3		
Coal, soft	1	5	5	1
Slate, pavement?				

George Fidler Farm Mine—No. 767 on Map IV.

On the Little Kanawha River, 0.6 mile northeast of Arlington; Middle Kittanning Coal; elevation, 1598′ B.

			Ft.	In.
Slate, black				
Coal	0′	6″		
Slate, black	0	5		
Coal	0	10		
Slate, black	0	6		
Coal, hard, bony	3	0	5	3
Slate pavement?				

H. U. Allman Farm Mine—No. 768 on Map IV.

On the Little Kanawha River, 0.7 mile northeast of Arlington; Lower Kittanning Coal; elevation, 1570′ B.

			Ft.	In.
Coal, thickness concealed				
Shale, gray			1	3
Coal	2′	0″		
Coal, bony	0	4		
Coal, medium-hard	1	8	4	0
Slate, pavement?				

At the **Porter Clarkson Farm Mine (No. 769 on Map IV)**, located on Cow Run, 0.9 mile southeast of Stillman, the Lower Kittanning had once been mined from the bed of the run at an elevation of 1540′ B., but had fallen shut, the coal being reported 7 feet thick.

Moore Brothers Farm Mine—No. 770 on Map IV.

On Little Kanawha River, 0.8 mile west of Holly Grove; Lo Kittanning Coal; butts, N. 86° E.; elevation, 1750' L.

				Ft.	In.
1.	Sandstone			3	0
2.	Slate, black			0	4
3.	Coal, soft	1'	0"		
4.	Coal, bony	0	5		
5.	Coal, soft	1	0		
6.	Slate, bony	0	6		
7.	Coal, medium-hard	1	8	4	7
8.	Slate, pavement				

A sample was collected from Nos. 2, 5, and 7, the c position of which is published under **Mine No.** 770 in table of coal analyses at the end of this Chapter.

Taylor Wilson Farm Mine—No. 771 on Map IV.

On a branch of Little Kanawha River, 0.6 mile southeast of H Grove; Lower Kittanning Coal; elevation, 1930' B.

			Ft.	In.
Slate, dark				
Coal	0'	11"		
Shale, gray	0	11		
Coal	1	10		
Coal, bony	0	3		
Coal	1	3		
Coal, slaty	1	0	6	2
Slate, pavement				

Moore and Gawthrop Farm Mine—No. 772 on Map IV.

On a branch of Little Kanawha River, 0.9 mile southeast of H Grove; Lower Kittanning Coal; butts, N. 86° E.; elevation, 1990'

				Ft.	In.
1.	Slate, black				
2.	Coal	0'	11"		
3.	Slate, bony	0	1		
4.	Coal	2	7		
5.	Slate, bony	0	3		
6.	Coal	1	0		
7.	Slate, bony	0	5		
8.	Coal, bony	1	6	6	9
9.	Slate, pavement, and concealed, to Homewood Sandstone			10	0

A sample was collected from Nos. 2, 4, and 6 of section, the composition of which is published under **Mine No. 772** in the table of coal analyses at the end of this Chapter.

A. A. Young Farm Mine—No. 773 on Map IV.

On a branch of Little Kanawha River, 1.2 miles southeast of Holly Grove; Lower Kittanning Coal; elevation, 2050′ B.

			Ft.	In.
Slate, dark				
Coal	1′	9″		
Coal, bony	0	11		
Coal	1	4		
Shale, gray	0	10		
Coal, bony	0	10	5	8
Slate, pavement, and concealed, to Homewood Sandstone			10	0

W. B. Sayre Farm Mine—No. 774 on Map IV.

On a branch of Little Kanawha River, 1.2 miles southeast of Holly Grove; Lower Kittanning Coal; elevation, 2040′ B.

			Ft.	In.
Slate, black				
Coal	3′	1″		
Slate, dark	0	3		
Coal	1	2		
Slate, bony	0	7		
Coal	1	5	6	6
Slate, pavement, and concealed, to Homewood Sandstone			15	0

P. R. Phillips Farm Mine—No. 775 on Map IV.

On a branch of Little Kanawha River, 1.6 miles southeast of Holly Grove; Lower Kittanning Coal; elevation, 2140′ B.

			Ft.	In.
Coal	1′	8″		
Coal, bony	1	1		
Coal, soft	1	11		
Slate, bony	0	7		
Coal	2	1	7	4
Slate, pavement, and concealed, to Homewood Sandstone cliff			3	0

W. K. Johnson Farm Mine—No. 776 on Map IV.

On a branch of Little Kanawha River, 1.5 miles southeast of I
Grove; Lower Kittanning Coal; elevation, 2130′ B.

			Ft.	In.
Coal, visible	1′	0″		
Shale, dark	1	0		
Coal	2	10		
Slate, bony	0	2		
Coal	1	1	6	1
Slate, pavement, and concealed, to Homewood Sandstone			5	0

The **William Sayre Farm Mine (No. 777 on Map I** located on a branch of Little Kanawha River, 1 mile south of Holly Grove, was half full of water, but appeared to s 4 to 5 feet of coal, its elevation being 1980′ B.

Jason Carpenter Farm Mine—No. 778 on Map IV.

On the Little Kanawha River, 1.2 miles northeast of Gaines; L
Kittanning Coal; elevation, 1845′ B.

			Ft.	In.
Shale, sandy			5	0
Coal	2′	3″		
Slate, bony	0	6		
Coal	2	0	4	9
Slate, pavement				

J. C. Ogden Farm Mine—No. 779 on Map IV.

On a branch of Little Kanawha River, 1 mile east of Gaines; L
Kittanning Coal; elevation, 1860′ B.

			Ft.	In.
Coal	2′	6″		
Slate, black, 0′ 1½″ to	0	4		
Coal	2	2	5	0

The above opening had fallen shut, its section b reported by a resident.

At **Farm Mine No. 780 on Map IV,** located on a bra of Little Kanawha River, 0.7 mile east of Gaines, the Lo Kittanning had once been mined by stripping at an eleva of 1835′ B., but the place had fallen shut, its thickness b reported as 5 feet.

Abram McDaniel Heirs Farm Mine—No. 781 on Map IV.

On Getout Run of Little Kanawha River, 2 miles northeast of Canaan; Lower Kittanning Coal; elevation, 2195′ B.

			Ft.	In.
Shale, sandy, with streaks of coal			3	0
Coal	1′	0″		
Shale, gray	0	8		
Coal, soft	1	10		
Coal, bony	0	6		
Coal, soft	1	11	5	11
Slate, pavement				

Herbert Bellingham Farm Mine—No. 782 on Map IV.

On the Little Kanawha River, at Canaan; Lower Kittanning Coal; elevation, 2285′ B.

			Ft.	In.
Sandstone, massive				
Coal	1′	8″		
Coal, bony	0	4		
Coal, reported	3	0	5	0

The **A. G. Strader Farm Mine (No. 783 on Map IV)**, located on the ridge at the head of Middle Fork of Little Kanawha, 0.8 mile southwest of Craddock, had fallen partly shut, but the Lower Kittanning was reported 4 feet thick with a parting near the middle, the tidal elevation being 2520′ B.

At the **Nimrod Lake Farm Mine (No. 784 on Map IV)**, located on a branch of Right Fork of Little Kanawha River, 1 mile northwest of Cleveland, at an elevation of 1665′ B., the Lower Kittanning measures 8′ 4″ thick, with partings, as published in detail in the section for Cleveland, page 153.

The Lower Kittanning was once opened at **Farm Mine No. 785 on Map IV**, on Right Fork of Little Kanawha, 1.2 miles southwest of Eden, at an elevation of 2010′ B., but had fallen shut, its thickness not being learned.

Middle and Lower Kittanning Coals, Leadsville District, Randolph.

In Leadsville District, the Middle and Lower Kittanning attain a fine development, being apparently both represented in one large thick bed that has been mined extensively on a commercial scale. The coal in this region has a low sulphur content that has made it valuable for coking purposes. The three following mines are located along Beaver Creek:

Davis Coal & Coke Co., Weaver Mine No. 1—No. 786 on Map IV.

Locatel on Beaver Creek, at Weaver; **Middle and Lower Kittanning Coals**; elevation, 1970′ B.

			Ft.	In.
Slate, black				
Coal, soft	0′	7″		
Slate, black	0	5		
Coal, soft	0	9		
Slate, black	1	10		
Coal, bony	1	4		
Coal, soft	1	6		
Fire clay, hard, sandy	0	5		
Coal	0	7		
Slate, black	0	2		
Coal	3	8		
Fire clay, gray	0	5		
Coal, soft	1	3		
Coal, bony, "knee deep"	1	1	14	0
Slate, pavement				

"Principal office, Cumberland, Md.; daily capacity, 150 tons; 19 miners and 5 laborers employed; horse haulage; no butts or faces; greatest rise, southeast; coal shipped East for steam fuel; H. H. Harrison, Superintendent, authority for mine data."

Nearly all the coal has been mined from the above opening, the present work being confined to a few scattered blocks of coal. A sample submitted by Mr. H. Hirsh from the files of the company shows the following analysis:

	Per cent.
Moisture	1.12
Volatile Matter	27.84
Fixed Carbon	60.05
Ash	12.11
Sulphur	1.26

Davis Coal & Coke Co., Weaver Mine No. 2—No. 787 on Map IV.

On Beaver Creek, at Weaver; Middle and Lower Kittanning Coals; elevation, 1980′ B.

			Ft.	In.
Slate, dark				
Coal, medium-hard	2′	8″		
Slate, dark, 2″ to	0	3		
Coal, bony	0	8		
Slate, dark	0	3		
Coal, soft	3	3		
Slate, dark	0	4		
Coal, good, soft	1	3		
Coal, bony, "knee deep"	1	0	9	8
Slate, pavement				

"Principal office, Cumberland, Md.; daily capacity, 450 tons; 70 miners and 30 laborers employed; rope haulage; no butts or faces; greatest rise, southeast; coal shipped East for steam fuel; H. H. Harrison, Superintendent, authority for mine data."

A sample collected from Weaver, and apparently from this opening, by A. P. Brady, and previously published in Volume II(A), page 512, under the name of **Maryland Smokeless Coal Company**, is given under **Mine No.** 787 in the table of coal analyses at the end of this Chapter. A sample of coke from this mine, collected by Mr. Brady, shows the following analysis, according to Hite:

	Per cent.
Moisture	0.23
Volatile Matter	1.10
Fixed Carbon	82.25
Ash	16.42
Total	100.00
Sulphur	1.24
Phosphorus	0.021

A sample of coal from this mine, submitted by Mr. Hirsh, shows the following:

	Per cent.
Moisture	1.18
Volatile Matter	29.29
Fixed Carbon	59.76
Ash	10.95
Sulphur	1.77

The following is a mine formerly operated by **W. H. Green**, but now held by the Davis Coal and Coke Company:

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Davis Coal and Coke Co., Williette Mine—No. 788 on Map IV.

On Beaver Creek, 0.5 mile northeast of Weaver; **Middle and Lower Kittanning Coals**; elevation, 2000′ B.

				Ft.	In.
1.	Slate				
2.	**Coal**	2′	8½″		
3.	Bone	0	5		
4.	**Coal**	2	2	5	3½
5.	Slate, pavement				

"Principal office, Cumberland, Md.; daily capacity, 200 tons; daily output, 75 tons; 20 miners and 4 laborers employed; coal shipped East and West for steam and smithing purposes; greatest rise, southeast; sample collected from Nos. 2 and 4 of section, in Room No. 1, off First Right, by D. D. Teets, Jr.; John Condry, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 788** in the table of coal analyses at the end of this Chapter.

The Davis Colliery Company operates a large mining establishment at Harding, consisting of five openings delivering coal to the same tipple, and including 85 beehive coke ovens, with an output of 140 tons of coke daily. Measurements made at the various openings show the following:

Davis Colliery Co., Harding Mine (No. 2 Opening)—No. 789 on Map IV.

On a branch of Tygart Valley River, 0.3 mile north of Harding; **Middle and Lower Kittanning Coals**; elevation, 1965′ B.

			Ft.	In.
Shale				
Coal, soft	3′	10″		
Slate, gray	0	6		
Coal, soft	1	10		
Slate, bony	0	11		
Coal, bony	1	2	8	3
Slate, pavement				

For production data, see No. 4 Opening.

Davis Colliery Co., Harding Mine (No. 3 Opening)—No. 790 on Map IV.

On a branch of Tygart Valley River, 0.6 mile northeast of Harding; **Middle and Lower Kittanning Coals**; elevation, 1965' B.

			Ft.	In.
Slate, dark				
Coal, soft	3'	2"		
Slate, dark	0	7		
Coal, harder	1	5		
Coal, bony	0	9	5	11
Slate, pavement				

For production data, see next opening.

Davis Colliery Co., Harding Mine (No. 4 Opening)—No. 791 on Map IV.

On a branch of Tygart Valley River, 0.9 mile northeast of Harding; **Middle and Lower Kittanning Coals**; elevation, 1990' B.

			Ft.	In.
1. Slate				
2. Coal	3'	7"		
3. Slate	0	4		
4. Coal	1	8	5	7
5. Slate				

"Principal office, Elkins; daily capacity of five openings, 1000 tons; daily output, 600 tons; 65 miners and 37 laborers employed; electric haulage; coal used partly for coke and partly shipped East for steam fuel; butts, N. 89° E.; faces, N. 1° W.; greatest rise, southeast; sample collected from Nos. 4 and 6 of section by D. D. Teets, Jr.; A. C. Davis, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 791** in the table of coal analyses at the end of this Chapter. A sample of coke, taken from the cars in the yard by Teets, shows the following analysis:

	Per cent.
Moisture	0.15
Volatile Matter	2.52
Fixed Carbon	82.13
Ash	15.20
Total	100.00
Sulphur	1.09
Phosphorus	0.018

Davis Colliery Co., Harding Mine (No. 5 Opening)—No. 792 on Map IV.

On a branch of Tygart Valley River, 0.9 mile northeast of Harding; Middle and Lower Kittanning Coals; elevation, 2045' B.

				Ft.	In.
1.	Shale, sandy				
2.	Coal	1'	0"		
3.	Slate	2	0		
4.	Coal, soft	3	0		
5.	Slate	0	4		
6.	Coal, soft	3	5		
7.	Slate, dark	0	6		
8.	Coal, soft	1	3		
9.	Coal, bony	0	11	12	5
10.	Slate, pavement				

For production data, see Opening No. 4.

The section as given above reveals the full thickness of the coals as they occur in this vicinity, Nos. 6 to 9, inclusive, being the portion usually mined.

Davis Colliery Co., Harding Mine (No. 1 Opening)—No. 793 on Map IV.

On a branch of Tygart Valley River, 0.6 mile northeast of Harding; Middle and Lower Kittanning Coals; elevation, 1995' B.

			Ft.	In.
Slate, black, with a few streaks of coal				
Coal, soft	3'	8"		
Slate, gray	0	4		
Coal, soft	3	7		
Slate, dark	0	5		
Coal, soft	1	2		
Coal, bony	0	8	9	10
Slate, pavement				

For production data, see Opening No. 4.

A section measured at the fan house shows the following:

Davis Colliery Co., Harding Mine (Fan-House Opening)—No. 794 on Map IV.

On a branch of Tygart Valley River, 0.6 mile northeast of Harding; Middle and Lower Kittanning Coals; elevation, 2000′ B.

			Ft.	In.
Shale, sandy				
Coal	0′	8″		
Slate, dark	0	4		
Coal	0	4		
Slate, dark, soft	1	9		
Coal, soft	3	10		
Slate, dark, hard	0	4		
Coal, soft	3	6		
Slate, dark	0	4		
Coal, soft	1	6		
Coal, bony	1	0	13	7
Slate, pavement				

A section measured at an air-hole toward the east edge of this group of mines shows the following:

Davis Colliery Co., Harding Mine (Air-Hole of No. 1 Opening)—No. 795 on Map IV.

On a branch of Tygart Valley River, 1.2 miles northeast of Harding; Middle and Lower Kittanning Coals; elevation, 2155′ B.

			Ft.	In.
Shale, sandy				
Slate, dark, cannelly			1	4
Shale, dark			1	6
Coal	0′	11″		
Slate, dark	0	1		
Coal, soft	2	6		
Bone, 1″ to	0	3		
Coal, soft	3	6		
Slate, dark	0	2		
Coal, soft	1	10	9	3
Slate, pavement				

A former measurement made at the Harding Mine by A. P. Brady is published in Volume II(A), pages 510-511, together with analyses of the coal and coke from the same, under the name of **Junior Coal Company**. Information is not available to show which opening Mr. Brady visited.

The following table of coke analyses from the Harding Mines was furnished Teets over the signature of E. H. May, Chemist:

Sample No.	2865	2866	2867	2868	2869	2870
Moisture	0.30	0.10	0.30	0.10	0.60	0.20
Volatile Matter	0.91	0.98	1.30	1.25	1.40	1.30
Fixed Carbon	86.79	84.12	84.65	84.45	83.60	83.80
Ash	12.00	14.80	13.75	14.20	14.40	14.70
Totals	100.00	100.00	100.00	100.00	100.00	100.00
Sulphur	1.30	1.22	1.38	1.30	1.53	1.24

Samples Nos. 2865-2869, inclusive, 48-hour foundry coke.
Sample No. 2870, 72-hour foundry coke.

Middle and Lower Kittanning Coals, Roaring Creek District, Randolph.

In Roaring Creek District, the Middle and Lower Kittanning have been mined extensively along Roaring Creek, where they combine to form one large seam, 8 to 10 feet thick. In the western portion of the District, toward Upshur County, they are separated by an interval of several feet of shale, slate, and sandstone, and the two beds have deteriorated individually, with the result that they have been mined in that region only for local domestic use.

At the northern end of the District, the coal has been opened at **Farm Mine No. 796 on Map IV**, on the Tygart River, 0.2 mile south of Findley, where it has a total thickness of 9′ 0″, as shown in detail in the section for Findley, page 164, the elevation being 2085′ B. At the **Coal and Coke Railway Exposure (No. 797 on Map IV)**, located on Laurel Run, 0.9 mile north of Loop Station, showed 5 to 6 feet of coal and slate, at an elevation of 2110′ B. The following exposure was noted at the east portal of the Kingsville Tunnel:

Coal and Coke Railway Exposure—No. 798 on Map IV.

On Little Laurel Run of Tygart Valley River, 0.8 mile southeast of Kingsville Station; Middle and Lower Kittanning Coals; elevation, 2195′ B.

	Ft.	In.
Coal, Middle Kittanning	3	0
Shale, sandy	8	0
Coal, Lower Kittanning (2195′ B.)	2	0
Slate, dark	6	0
Coal, streak, Clarion	0	6
Sandstone, to grade	10	0

The **John Higgins Farm Mine (No. 799 on Map IV)**, located on Big Laurel Run, 1.1 miles northeast of Pumpkintown, at an elevation of 2275′ B., had partly fallen shut, but the Lower Kittanning Coal was reported 7 feet thick, only 3 feet being visible. The following opening shows the Middle Kittanning on the same farm:

John Higgins Farm Mine—No. 800 on Map IV.

On Big Laurel Run, 1.2 miles northeast of Pumpkintown; Middle Kittanning Coal; elevation, 2310′ B.

			Ft.	In.
Coal blossom and black slate				
Coal, cannelly	0′	10″		
Coal, soft	2	0		
Coal, bony	1	2		
Coal, soft	1	4	5	4
Slate, pavement				

Several openings have been made along the Tygart Valley River between Leiter and Roaring Creek Junction. The following is a new mine, recently opened for railroad shipment

Davis Colliery Company, Sivad No. 5B Mine—No. 801 on Map IV.

On the Tygart Valley River, 0.8 mile southwest of Harding; Middle and Lower Kittanning Coals; elevation, 2020′ B.

			Ft.	In.
1. Slate				
2. Coal	0′	5″		
3. Slate	0	5		
4. Coal	3	2		
5. Slate	1	6		
6. Coal	2	10	8	4
7. Slate, pavement				

"Principal office, Elkins; daily capacity, 150 tons; daily output, 50 tons; 5 miners and 3 laborers employed; horse haulage; greatest rise, west; sample collected in Main Heading, 150 feet from mine mouth, from Nos. 2, 4, and 6 of section, by D. D. Teets, Jr.; Leslie Wilmoth, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 801** in the table of coal analyses at the end of this Chapter

Davis Colliery Company, Sivad No. 5 Mine—No. 802 on Map IV.

On the Tygart Valley River, 0.3 mile west of Harding; **Middle and Lower Kittanning Coals**; elevation, 1990′ B.

			Ft.	In.
Slate, dark				
Coal, soft	1′	11″		
Slate, black	0	4		
Coal, soft	0	4		
Slate, black	0	6		
Coal, soft	3	1		
Slate, black	0	6		
Coal	1	8	8	4
Slate, pavement				

The coal has been opened on the Tygart Valley River, just northwest of Roaring Creek Junction, at the **Davis Colliery Company No. 5 Mine (No. 803 on Map IV)**, known as the **"Coaling Station"**, and being a southern outlet for the No. 5 Mine and used to wagon coal to the village of Roaring Creek Junction. Here the coal exhibits a thickness of 6′ 7″, as published in detail in the section for Roaring Creek Junction, page 166, its elevation being 2030′ B.

Davis Colliery Company, Sivad No. 2 Mine—No. 804 on Map IV.

On Grassy Run, 0.7 mile south of Roaring Creek Junction; **Middle and Lower Kittanning Coal**; elevation, 2030′ B.

				Ft.	In.
1.	Slate				
2.	**Coal**	1′	6 ″		
3.	Slate	0	0½		
4.	**Coal**	0	3½		
5.	Slate	0	1		
6.	**Coal**	3	4		
7.	Slate	0	4		
8.	**Coal**	1	10	7	5
9.	Slate				

"Principal office, Elkins; daily capacity, 450 tons; daily output, 300 tons; 40 miners and 12 laborers employed; coal principally shipped East for domestic and steam fuel; greatest rise, south; sample collected from Nos. 2, 4, 6, and 8 of section, in Room No. 2 off 2nd Right, by D. D. Teets, Jr.; Leslie Wilmoth, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No.** 804 in the table of coal analyses at the end of this Chapter.

The coal is mined exclusively along Roaring Creek, where it attains a fine development, the creek valley being almost coincident with the axis of the Belington Syncline, and thus affording ideal locations for mines. The following opening was one of the original farm mines that were used for local fuel prior to the commercial development:

Edwin Scott Farm Mine—No. 805 on Map IV.

On Roaring Creek, 0.6 mile southeast of Roaring Creek Junction; **Middle and Lower Kittanning Coal**; elevation, 2050′ B.

			Ft.	In.
Slate, black, cannel			1	6
Shale, dark			1	0
Coal, soft	3′	2″		
Coal, bony	0	5		
Coal, soft	3	1		
Slate, dark	0	7		
Coal, medium-hard	1	5	8	8
Slate, pavement				

The following exposure was noted along the Coal and Coke Railway grade:

Coal and Coke Railway Exposure—No. 806 on Map IV.

On Roaring Creek, at the west edge of Coalton; **Middle and Lower Kittanning Coals**; elevation, 2175′ B.

			Ft.	In.
Shale, sandy			15	0
Slate, black, bony			1	6
Slate, dark			1	6
Coal, soft	3′	3″		
Slate, dark	0	2		
Coal, soft	3	2	6	7
Shale, gray, and concealed			2	0
Sandstone, shaly			10	0
Concealed to creek			15	0

The Davis Colliery Company operates a large coal mine and coke yard at Coalton, the coal being handled from a central tipple that serves the openings on either side of the small branch of Roaring Creek on which they are located. These mines are located almost on the axis of the Belington Syncline, which affords an ideal mining structure. The following measurements were made in these mines:

Davis Colliery Co., Coalton Mine No. 1 (No. 3 Opening)—No. 807 on Map IV.

On the north side of a branch of Roaring Creek, at Coalton; **Middle and Lower Kittanning Coals**; elevation, 2190′ B.

				Ft.	In.
1.	Slate				
2.	**Top coal, bony**	0′	10 ″		
3.	Bone	0	1½		
4.	**Coal**	1	11		
5.	Slate, black	0	1		
6.	**Coal**	2	10½		
7.	Slate	0	3		
8.	**Coal**	1	6	7	7
9.	Slate, pavement				

"Principal office, Elkins; daily capacity (for both openings), 2000 tons; daily output, 1000 tons; 114 miners and 45 laborers employed; electric haulage; coal used partly for coke and partly shipped East and West for steam and domestic fuel; butts, N. 85° E.; faces N. 5° W.; greatest rise, southwest and southeast; sample collected from Nos. 2, 4, 6, and 8 of section in Room No. 31, on 2nd Right, by D. D. Teets, Jr.; Joseph Hoylman, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 807** in the table of coal analyses at the end of this Chapter.

The following interesting measurement was secured at the opening south of the stream, the section of the main coal bed being made in the Gassaway Heading of the mine, while the lower strata were observed immediately below the mouth of the mine, next to the railroad track:

Davis Colliery Co., Coalton Mine No. 1 (Nos. 1 and 2 Openings)—No. 808 on Map IV.

On the south side of a branch of Roaring Creek, at Coalton; **Middle and Lower Kittanning Coals**; elevation, 2190′ B.

					Ft.	In.
1.	Second black slate, laminated					
2.	First black slate, cannel bone				2	8
3.	Shale, gray				1	4
4.	**Coal, bony**	1′	0 ″	**Middle and Lower Kittanning** (2190′ B.)	7	8
5.	**Coal, soft**	2	2½			
6.	Slate, dark	0	0½			
7.	**Coal, soft**	3	1			
8.	Slate, dark	0	4			
9.	**Coal, soft**	1	0			

		Ft.	In.
10.	Fire clay	2	0
11.	Sandstone, shaly	8	0
12.	Shale, dark, sandy	5	0
13.	Coal, medium-hard, with lenticular streaks of slate, Upper Clarion	2	8
14.	Fire clay shale	4	0
15.	Coal, medium-hard ....1′ 4″ } Lower Clarion...	3	11
16.	Coal, bony.......0 7		
17.	Coal, soft........2 0		
18.	Slate, pavement, at railroad grade		

For production data, see Opening No. 3.

The above section reveals two coals of considerable thickness between the Lower Kittanning and the Homewood Sandstone which belongs only a few feet below drainage at this point. It is barely possible that the main bed that is mined, Nos. 4-9 of section, represents only the Middle Kittanning and that coal No. 13 of section should be called the true Lower Kittanning instead of Upper Clarion, as named.

The company has 250 beehive coke ovens, only 175 of which were in blast at the time of the writer's visit, the daily coke output being 400 tons. The coke is extracted with a Covington Machine. The company has kindly furnished the following analyses of coal and coke from these mines, the coal analyses being by E. H. May, and the coke analyses by F. S. Johnson, chemists:

Coalton Mines, Coal Analyses.

Sample No.	1	2	3	2510	2511	2512	2513
Moisture	0.30	0.45	0.50	1.35	1.32	1.17	1.50
Volatile Matter	29.70	30.80	31.15	29.92	30.44	31.33	27.60
Fixed Carbon	58.50	58.85	55.55	57.93	58.15	57.20	61.05
Ash	11.50	10.90	12.80	10.80	10.09	10.30	9.85
Totals	100.00	101.00	100.00	100.00	100.00	100.00	100.00
Sulphur	1.53	1.49	1.62	1.84	2.27	2.03	1.70

Sample No. 1, from Room 29 off 1st Left, off Heading 46, No. 1 Opening.
Sample No. 2, from 1st Left Heading, off Heading 46, No. 1 Opening.
Sample No. 3, from Room 3, off Air-Course 28.
Sample No. 2510, from Room 21, off 1st Right Heading, No. 3 Opening.
Sample No. 2511, from Room 26, off 1st Right Heading, No. 3 Opening.
Sample No. 2512, from Room 31, off 2nd Right Heading, No. 3 Opening.
Sample No. 2513, from Room 24, off 2nd Right Heading, No. 3 Opening.

Coalton Mines, Coke Analyses.

Sample No.	1	2	2836	2837	2838
Moisture	0.33	0.43	0.14	0.22	0.20
Volatile Matter	0.95	1.02	1.13	0.95	0.80
Fixed Carbon	83.20	82.68	81.88	82.06	82.60
Ash	15.52	15.87	16.85	16.77	16.40
Totals	100.00	100.00	100.00	100.00	100.00

Sample No. 1, average for the month of October, 1915.
Sample No. 2, average for the month of November, 1915.
Sample No. 2836, furnace coke, taken April 15, 1916.
Sample No. 2837, furnace coke, taken April 15, 1916.
Sample No. 2838, furnace coke, taken April 15, 1916.

One of the above mines was once examined and sampled by A. P. Brady and the results published in Volume II(A), page 513, and an interesting section made by Dr. White at the same place is published in the same volume, page 514.

The following mine, now abandoned, was located in the same vicinity:

W. H. Green, Leroy Mine—No. 809 on Map IV.

On Roaring Creek, 0.5 mile southwest of Coalton; **Middle and Lower Kittanning Coals**; elevation, 2330′ B.

			Ft.	In.
Coal, bony, thickness concealed				
Coal, soft	2′	11″		
Slate, dark	0	2		
Coal, soft	3	3		
Shale, gray	0	3		
Coal, soft	1	7	8	2
Slate, pavement, and concealed to **Homewood Sandstone**			35	0

Two commercial mines are in operation in the vicinity of Mabie, showing the following sections:

A. Spates Brady Mine—No. 810 on Map IV.

On Roaring Creek, 0.7 mile northeast of Mabie; **Middle and Lower Kittanning Coals**; elevation, 2265′ B.

				Ft.	In.
1.	Slate				
2.	Coal, bony	0′	11 ″		
3.	Coal	2	0		
4.	Slate	0	0¾		

			Ft.	In.
5. **Coal**	3′	4″		
6. Slate	0	4		
7. **Coal**	1	10¼	8	6
8. Slate				

"Principal office, Piedmont; coal owned by McMillen Brothers; daily capacity, 500 tons; daily output, 300 tons; 50 miners and 10 laborers employed; coal shipped East and West for steam and domestic fuel; greatest rise, southwest; sample collected in Room off 2nd Left by D. D. Teets, Jr.; F. M. Offutt, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 810** in the table of coal analyses at the end of this Chapter.

The mining section, as secured at the working face, does not show the entire section of the coal, the following measurement having been obtained at the mine mouth:

			Ft.	In.
Shale, sandy			15	0
Coal	2′	0″		
Slate, dark	1	6		
Coal, hard	1	0		
Coal, soft	2	7		
Slate, black	0	2		
Coal, soft	3	4		
Slate, dark	0	4		
Coal, soft	1	9	12	8
Slate, pavement				

J. B. Jenkins Coal & Coke Co. Mine—No. 811 on Map IV.

On Roaring Creek, 0.3 mile south of Mabie; **Middle and Lower Kittanning Coals**; elevation, 2320′ B.

¼

			Ft.	In.
1. Slate				
2. **Coal**, bony, visible	0′	9″		
3. **Coal**	2	6		
4. Slate, black	0	0¾		
5. **Coal**	3	2		
6. Slate	0	4		
7. **Coal**	1	9		
8. Slate	0	0¼		
9. **Coal**	0	9	9	4
10. Slate, pavement				

"Principal office, Buffalo, N. Y.; daily capacity, 500 tons; daily output, 300 to 400 tons; 40 miners and 15 laborers employed; electric haulage; coal shipped East and West; butts, N. 84° E.; faces, N. 6° W.;

greatest rise, southwest; sample collected in Room No. 7, off 3rd Left, by D. D. Teets, Jr.; I. T. Fallon, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 811** in the table of coal analyses at the end of this Chapter.

Some other prospects and farm openings have been made farther south along the Belington Syncline, the following being noted:

Davis Colliery Company Prospect—No. 812 on Map IV.

On a branch of Flatbush Fork of Roaring Creek, 0.2 mile southeast of Pumpkintown; **Lower Kittanning Coal**; elevation, 2455′ B

			Ft.	In.
Slate, dark				
Coal	1′	3″		
Coal, bony	0	10		
Coal, soft	2	8	4	9
Slate, pavement				

Arnold and Goff Farm Mine—No. 813 on Map IV.

On Roaring Creek, 1.4 miles south of Mabie; **Middle and Lower Kittanning Coal**; elevation, 2435′ B.

			Ft.	In.
Concealed				
Coal	2′	2 ″		
Slate, black	0	1½		
Coal, soft	1	0		
Bone, 0″ to	0	2		
Coal, soft	1	10½		
Slate, dark	0	5		
Coal, soft	1	5	7	2
Slate, pavement				

A few openings have been made on the waters of Middle Fork River in Roaring Creek District, the following having been noted:

Coal and Coke Railway Exposure—No. 814 on Map IV.

On Devil Run, at west portal of Kingsville Tunnel, 0.6 mile southeast of Kingsville; **Lower Kittanning Coal**; elevation, 2195′ B.

	Ft.	In.
Sandstone, massive, **East Lynn**		

			Ft.	In.
Coal	4'	0"		
Slate, gray	0	6		
Coal	1	0	5	6
Slate, dark			4	0
Coal			1	0
Shale, dark			8	0
Coal, slaty			0	6
Slate, dark, to grade			5	0

The two following openings were noted by Teets along Hell Run:

Joseph Bliny Farm Mine—No. 815 on Map IV.

On Hell Run, 0.9 mile northwest of Kingsville; **Lower Kittanning Coal**; elevation, 2235' B.

			Ft.	In
Sandstone, massive				
Coal	0'	10"		
Slate, dark	2	4		
Coal, visible	1	6	4	8

Hamilton Markley Farm Mine—No. 816 on Map IV.

On Hell Run, 0.2 mile southwest of Kingsville; **Lower Kittanning Coal**; elevation, 2250' B.

			Ft.	In
Sandstone, roof				
Coal	1'	0"		
Coal, bony	0	10		
Coal, soft	1	4		
Slate	0	9		
Coal	0	6	4	5
Slate, pavement				

The Lower Kittanning was once opened at the **Wilbur Kimble Farm Mine (No. 817 on Map IV)**, on Kettle Run, 2.6 miles southeast of Gale, at an elevation of 2440' B., but the opening had fallen shut and its thickness was not learned.

Middle and Lower Kittanning Coals, Middle Fork District, Randolph.

In Middle Fork District, the Lower Kittanning Coal covers a few high hills east of Middle Fork River in the region of Cassity Fork. The **G. A. Newlon Heirs Prospect (No. 818**

on Map IV), located on a branch of Cassity Fork, 2.6 miles east of Cassity, at an elevation of 2650′ B., had fallen shut, but according to R. O. Zirkle the coal measured 6′ 6″, with 1 inch of slate near the top of the seam. No other openings were observed.

Quantity of Middle and Lower Kittanning Coals Available.

In addition to the coal openings described on the preceding pages, the accompanying table shows a list of oil and gas wells that record the Lower Kittanning in the regions where its horizon is under drainage. Lists of the diamond drill borings showing its thickness have already been published, pages 397-8 and 414. Another table is added showing the probable amount of this coal by magisterial districts, the areal extent of which was measured with planimeter by Tucker according to the surface and underground areas outlined for it on Maps II and IV and Figure 10. The estimated thickness includes the total to be derived from both the Middle and Lower Kittanning, whether occurring as one large bed or as two separate seams.

List of Oil and Gas Wells Recording Lower Kittanning Coal.

No. on Map.	Name of Well.	Location.	Elevation of well mouth. A. T.	Depth to Coal. Feet.	Thickness. Feet.
	Barbour County:				
15	T. O. Martin No. 1.....	Century, 1.9 mi. N. E...	1160B	610	10
17	E. D. Talbott Hrs. No. 2.	Philippi, 0.5 mi. W......	1414L	208	4
	Upshur County:				
41	Isaac S. Reger No. 1....	Ruraldale, 2.1 mi. W...	1075B	610	5
42	Wm. Post No. 1.........	Buckhannon, 3 mi. N...	1410B	681	15(?)
46	J. F. Gould Heirs No. 2..	Abbott, 1.7 mi. N.......	1220B	330	5
49	Louvina Linger No. 1...	Abbott, 1.6 mi. N. E....	1380B	477	8
49A	J. J. Green No. 1.......	Abbott, 1.3 mi. N.......	1450B	495	5
50	John Smith No. 1.......	Atlas, 2.5 mi. S. W.....	1365B	490	2
53	L. J. Lewis No. 1........	Abbott, 1.6 mi. N. E....	1505L	468	4
57	James Duncan No. 1....	Abbott, 1.4 mi. N. W....	1365B	477	4
57A	Smith & Green No. 1...	Abbott, 1.3 mi. N.......	1285B	348	5

Probable Amount of Middle and Lower Kittanning Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Barbour:					
Pleasant	4	19.10	12,224	2,129,909,760	85,196,390
Union	3	26.80	17,152	2,241,423,360	89,656,934
Philippi	5	41.95	26,848	5,847,494,400	233,899,776
Cove	4	49.65	31,776	5,536,650,240	221,466,010
Glade	3	40.30	25,792	3,370,498,560	134,819,942
Barker	5	33.65	21,536	4,690,540,800	187,621,632
Valley	4	30.60	19,584	3,412,316,160	136,492,646
Totals...............		242.05	154,912	27,228,833,280	1,089,153,330
Upshur:					
Warren	3	33.00	21,120	2,759,961,600	110,398,464
Buckhannon ...	3	35.10	22,464	2,935,595,520	117,423,821
Union	4	41.20	26,368	4,594,360,320	183,774,413
Meade	4	52.30	33,472	5,832,161,280	233,286,451
Washington	4	30.30	19,392	3,378,862,080	135,154,483
Banks	5	55.95	35,808	7,798,982,400	311,959,296
Totals		247.85	158,624	27,299,923,200	1,091,996,928
Randolph:					
Leadsville	6	3.35	2,144	560,355,840	22,414,234
Roaring Creek..	6	23.90	15,296	3,997,762,560	159,910,502
Middle Fork....	5	1.95	1,248	271,814,400	10,872,576
Totals		29.20	18,688	4,829,932,800	193,197,312
Totals for Area.............		519.10	332,224	59,358,689,280	2,374,347,570

CLARION COAL.

The Clarion Coal, sometimes occurring 20 to 30 feet below the Lower Kittanning, is found in all three counties, but in a few localities only. It has been previously discussed in Chapter VII, page 262, and its crop is shown on Maps II and IV in those regions where it is of possible minable thickness. It is a multiple-bedded seam, varying in thickness from 1 to 10 feet, a considerable proportion of the latter thickness being slate, whenever the bed attains such a development. It has been mined commercially at a few points but always at a great disadvantage, owing to the slate that must be removed. Figure 11 shows its possible areal extent as a minable seam.

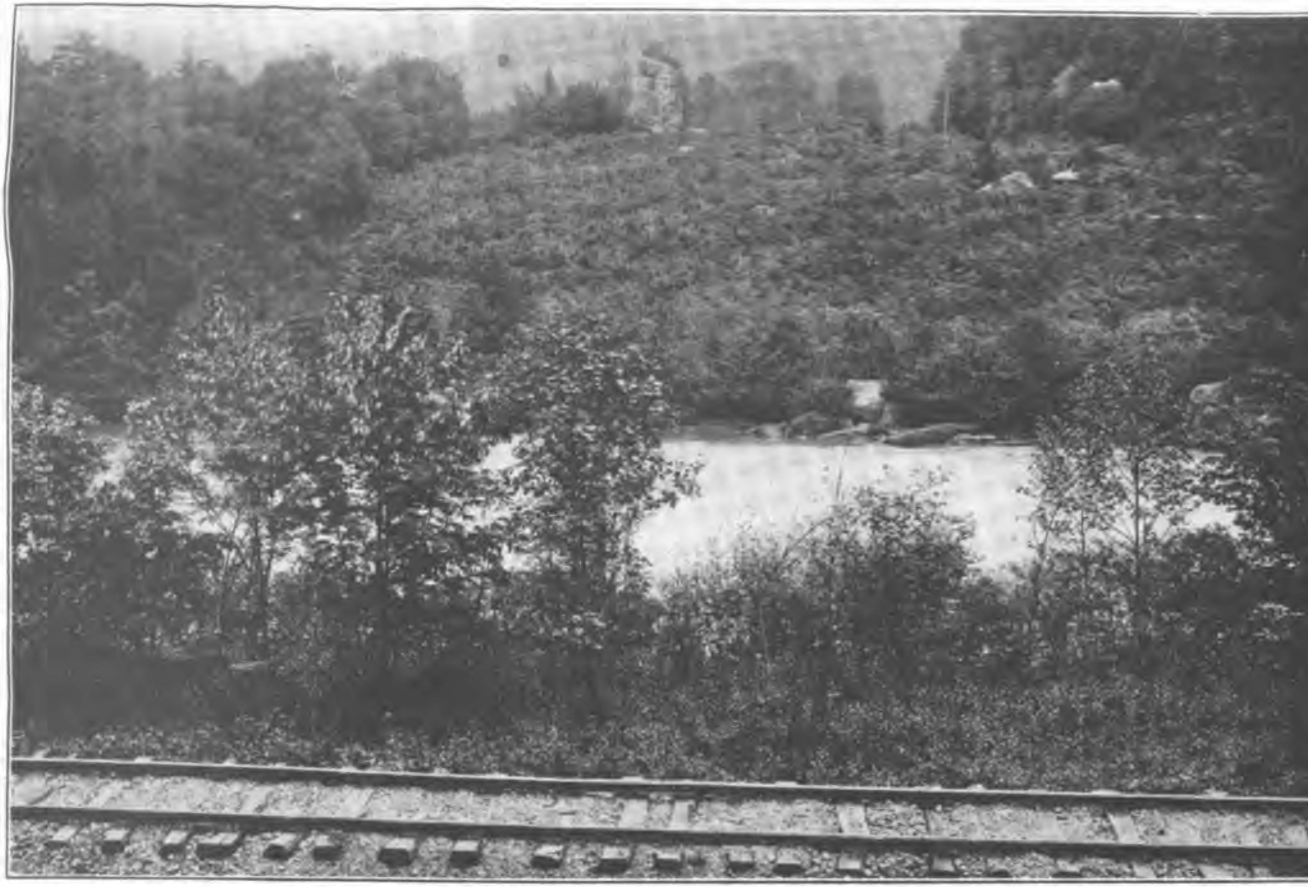

PLATE XXXVII.—"Balancing Rock," a remnant of the Upper Connoquenessing Sandstone, at mouth at Roaring Cr
one-half mile southeast of Roaring Creek Junction, Randolph County; Tygart Valley River in foreground.

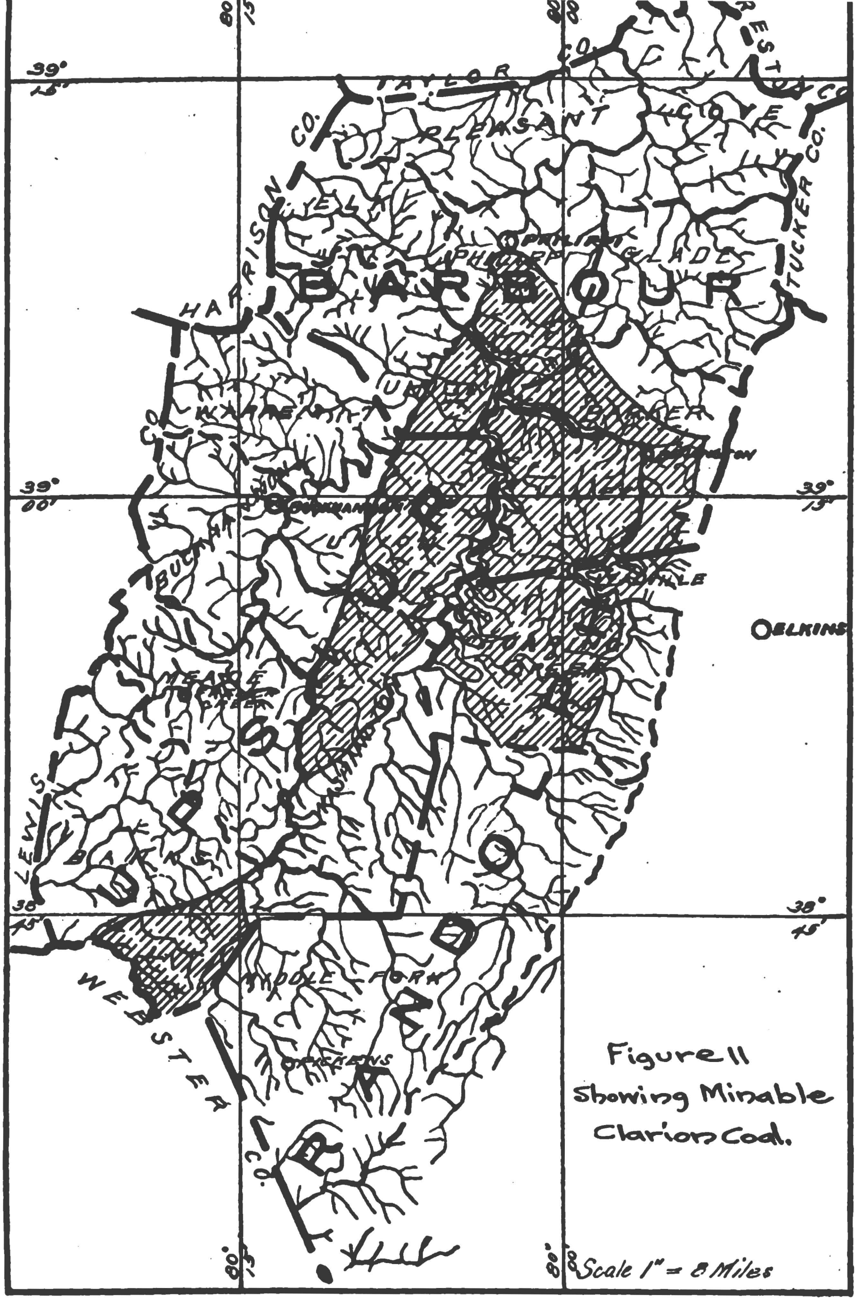

Figure 11
Showing Minable
Clarion Coal.

Clarion Coal, Union District, Barbour.

In Union District, the following opening was noted by Teets:

George Street Heirs Farm Mine—No. 818A on Map II.

On the Tygart Valley River, 0.5 mile southwest of Adma; **Clarion Coal**; butts, S. 79° W.; elevation, 1705′ B.

			Ft.	In.
Sandstone, massive, pebbly, **Clarion**, visible			15	0
Coal, soft	2′	5″		
Slate, dark	1	1		
Coal, soft	0	6		
Shale	0	5		
Coal, harder, visible	2	9	7	2

Clarion Coal, Philippi District, Barbour.

In Philippi District, the Clarion Coal was once opened at the **Laurel Coal Company Prospect (No. 819 on Map II)**, on the Tygart Valley River, 0.6 mile northeast of Arden, its elevation being 1315′ B., and its distance below the Lower Kittanning 15 feet. The old prospect had fallen shut and its thickness was not learned. Another prospect farther up the Tygart Valley shows the following:

Grafton Fuel Company Prospect—No. 820 on Map II.

On the Tygart Valley River, 0.4 mile north of Lillian; **Clarion Coal**; elevation, 1331′ L.

			Ft.	In.
Slate, black				
Coal	0′	10″		
Slate, bony	0	4		
Coal	3	3	4	5
Slate, pavement				

The coal at this point is 30 feet, hand-level, below the Lower Kittanning.

At Adma Station it was once operated at the **H. M. Crawford & Company Mine (No. 821 on Map II)**, where, as exhibited in the section for Adma, page 100, it is 7′ 8″ thick, with partings, at an elevation of 1715′ B. The mine is now inactive, but it was once sampled by Ray V. Hennen and the results published in Volume II(A), page 516, under the title of **Pennsylvania Coal and Mining Company.** The composition of the sample is published in the present report under **Mine No. 821** in the table of coal analyses at the end of this Chapter. In Volume II(A), this mine is classified under the Lower Kittanning Coal, but the writer is of the opinion that it is the Clarion Coal because, primarily, its interval of 175 feet above the base of the great pebbly and unmistakable Upper Connoquenessing Sandstone is too small to place it at the Lower Kittanning horizon, and secondly, because another coal is found 55 feet above it in the same hill (Mine No. 585) that represents the true Lower Kittanning at its usual interval above the base of the conglomerate, and lastly, because of its great similarity to the Clarion Coal as shown by the Davis Coal and Coke Company Prospect (No. 833 on Map IV), which is visible at Weaver at an interval of about 50 feet below the Lower Kittanning.

The following is another prospect in the same coal:

H. M. Crawford and Company Prospect—No. 822 on Map II.

On the Tygart Valley River, 0.3 mile northeast of Adma Station; Clarion Coal; elevation, 1725' B.

			Ft.	In.
Sandstone, massive, pebbly, Clarion, visible...			10	0
Coal, medium-soft, 1' 0" to.........	1'	6"		
Slate, gray, 0' 1" to..............	1	6		
Coal, medium-soft..................	2	10		
Coal, slaty........................	0	6		
Coal, medium-soft..................	0	9		
Slate, gray........................	0	3		
Coal, medium-soft..................	0	7		
Coal, slaty........................	0	7	8	6
Slate, gray, pavement..........................				

Clarion Coal, Barker District, Barbour.

In Barker District, the Clarion Coal is above drainage along the Tygart Valley River along both flanks of the Hiram Anticline and it has been prospected and mined at a few points.

This coal is opened at the **H. M. Crawford and Company Mine (No. 823 on Map II)**, at Clements, on the Tygart Valley River, the mine having an elevation of 1752′ L., and showing a total thickness of 9′ 3″, with partings, as given in detail in the section for Clements, page 110. The composition of a sample from this opening, as taken by Teets, is published under **Mine No. 823** in the table of coal analyses at the end of this Chapter. This mine was idle at the time it was visited by Teets and the writer, but has since been put in operation.

A prospect made in the same vicinity shows the following:

H. M. Crawford & Company Prospect—No. 824 on Map II.

On the Tygart Valley River, 0.3 mile northeast of Clements; **Clarion Coal**; elevation, 1750′ B.

			Ft.	In.
Concealed and shale			10	0
Sandstone, massive, **Clarion**			10	0
Coal, soft	2′	4″		
Slate, dark-gray, 0½″ to	0	1		
Coal	0	9		
Shale, gray, 2′ 0″ to	0	6		
Coal, visible	1	6	5	2
Coal, thickness concealed by water, and concealed to **Upper Connoquenessing Sandstone**			35	0

Clarion Coal, Valley District, Barbour.

Only a few exposures of the Clarion were noted in Valley District, the following being reported by Teets:

On Zebs Creek, of Tygart Valley, the **George Thorn Farm Mine (No. 825 on Map II)**, located 1.7 miles southwest of Junior, showed 1′ 9″ of coal at an elevation of 1825′ B.

D. C. Carpenter Farm Mine—No. 826 on Map II.

On Zebs Creek, 1.8 miles southwest of Junior; **Clarion Coal**; elevation, 1845′ B.

			Ft.	In.
Sandstone, massive, **Clarion**, visible			15	0
Slate, with plant fossils			1	1
Coal, hard	0′	6 ″		
Slate, gray	0	0½		
Coal	0	5½		

			Ft.	In.
Slate	0′	1″		
Coal	0	5	1	6
Slate, pavement				

Frank Wiseman Farm Mine—No. 827 on Map II.

On a branch of Middle Fork River, 2.1 miles southeast of Swamp Run; **Clarion Coal**; elevation, 1920′ B.

			Ft.	In.
Sandstone, roof				
Coal, soft	0′	6″		
Coal, bony	0	4		
Coal, soft	1	6		
Coal, bony	0	8		
Coal	0	6	3	6

Clarion Coal, Union District, Upshur.

In Union District, the Clarion Coal was noted by Teets at the **Wm. Moreland Farm Mine (No. 828 on Map IV)**, on Sand Run, 0.8 mile south of Wentz Ford, occurring here at an elevation of 1400′ B., and being 26 feet below the Lower Kittanning. The opening had fallen shut, its thickness n being reported.

Clarion Coal, Washington District, Upshur.

The Clarion Coal was noted in Washington District at two localities, as follows:

Coal and Coke Railway Exposure—No. 829 on Map IV.

On the Buckhannon River, 0.1 mile north of Ours Mill; **Clarion Coal**; elevation, 1525′ B.

	Ft.	In.
Shale, sandy	15	0
Limestone, siliceous	1	0
Shale, sandy	7	0
Coal, Lower Kittanning (1555′ B.)	5	0
Shale, dark	3	0
Sandstone, flaggy, **Clarion**	24	0
Coal, Clarion (1525′ B)	3	2
Shale, to grade	1	0

The second locality was at the **Coal and Coke Railway Exposure (No. 830 on Map IV)**, at the east portal of the Sand Run Tunnel, on Sand Run, as shown in detail by the section for Sand Run, page 140, the Clarion Coal was 2′ 9″ thick, at an elevation of 1988′ L., being 23 feet below the Lower Kittanning.

Clarion Coal, Banks District, Upshur.

In Banks District, the Clarion was noted near the head of the Little Kanawha River. At **Coal Exposure No. 831 on Map IV,** located on the Little Kanawha River, 1.2 miles northeast of Gaines, the coal is visible as a heavy blossom in the road at an elevation of 1825′ B. The **J. C. Ogden Farm Mine (No. 832 on Map IV),** located on a branch of the Little Kanawha, 0.9 mile east of Gaines, had fallen shut and could not be measured, but the coal was reported 3 feet thick. Here it had been mined by stripping at an elevation of 1835′ B., being 2 feet below the Lower Kittanning.

Clarion Coal, Leadsville District, Randolph.

In Leadsville District, the following prospect has recently been opened showing the Clarion at its maximum development, being, as usual, full of slate partings:

Davis Coal and Coke Company Prospect—No. 833 on Map IV.

On Beaver Creek, at Weaver; Clarion Coal; elevation, 1970′ B.

			Ft.	In.
Sandstone, somewhat flaggy, grayish-white, Clarion, visible			20	0
Coal, soft	2′	0″		
Coal, bony	0	5		
Fire clay, sandy, dark-gray	1	7		
Coal, cannel, partly bone	0	6		
Fire clay, dark-gray, soft	1	0		
Coal, good	1	9		
Fire clay, grayish-white, 2″ to	0	4		
Coal, bony, with streaks of slate in center	0	5		
Fire clay, dark-gray	0	11		
Coal, soft	0	3		
Fire clay, dark	0	8		
Coal, soft, slaty	1	7	11	5
Slate, pavement				

The coal here occurs at an estimated interval of 50 to 60 feet below the Lower Kittanning which has been mined in the hill above it, the rise of the rocks making an accurate measurement between the two seams impossible.

Clarion Coal, Roaring Creek District, Randolph.

In Roaring Creek District, the Clarion was observed at a few points, being usually too thin and slaty to be of much value. It was once mined commercially at Leiter, but the place was abandoned owing to the large amount of slate. A measurement made by Teets at this old mine shows the following:

Davis Coal and Coke Co., Leiter Mine (Abandoned)—No. 834 on Map IV.

On the Tygart Valley River, 0.3 mile south of Leiter; **Clarion Coal**; elevation, 2025′ B.

			Ft.	In.
Shale				
Coal, croppy	1′	6″		
Slate, black	0	10		
Coal	1	2		
Slate, bony	0	8		
Coal	0	1		
Slate, dark	0	9		
Coal	2	8		
Shale, gray	0	10		
Coal, soft, visible	1	3	9	9

A sample was once collected from this mine and published in Bulletin 2, page 300, of the Survey, under the name of **Maryland Smokeless Coal Company.** It is published in the present Report under **Mine No. 834** in the table of coal analyses at the end of this Chapter.

The coal is exposed at several points along the Coal and Coke Railway grade west of Leiter, usually occurring from 10 to 20 feet below the Lower Kittanning. At the **Coal and Coke Railway Exposure (No. 835 on Map IV),** on Little Laurel Run of Tygart Valley River, 0.8 mile northwest of Loop Station, the coal varies from 1 to 3 feet, its elevation being 2080′ B. At the **Coal and Coke Railway Exposure (No.**

836 on Map IV), on Little Laurel Run, 1 mile northwest of Loop Station, the coal is 2′ 0″ thick, its elevation being 2015′ B. At the **Coal and Coke Railway Exposure (No. 837 on Map IV)**, on the same run, 1 mile northwest of Loop Station, it is 4 feet thick, at an elevation of 2135′ B. The following exposure shows its relationship to the Lower Kittanning:

Coal and Coke Railway Exposure—No. 838 on Map IV.

On Little Laurel Run, 1 mile west of Loop Station; **Clarion Coal**; elevation, 2146′ B.

	Ft.	In.
Sandstone, massive, **East Lynn**................	10	0
Coal, Lower Kittanning (2150′ B.) 6′ to.........	7	0
Shale, sandy and dark.........................	5	0
Coal, Clarion (2144′ B)........................	1	0
Shale, dark and sandy, to grade..............	10	0

Quantity of Clarion Coal Available.

In addition to the coal openings described on the preceding pages, the accompanying table shows a list of oil and gas wells that record the Clarion Coal in the regions where its horizon is under drainage. Its presence is also recorded in a few of the diamond drill borings published on previous pages of this Chapter. Another table is added showing the probable amount of this coal by magisterial districts, the areal extent of which was measured with planimeter by Tucker according to the surface and underground areas outlined for it on Maps II and IV and Figure 11.

List of Oil and Gas Wells Recording Clarion Coal.

No. on Map.	Name of Well.	Location.	Elevation of well mouth. A. T.	Deuth to Coal. Feet.	Thickness. Feet.
	Upshur County:				
41	Isaac S. Reger No. 1.....	Ruraldale, 2.1 mi. W...	1075B	652	6
57A	Smith & Green No. 1....	Abbott, 1.3 mi. N......	1285B	370	5

Probable Amount of Clarion Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Barbour:					
Philippi	2	15.70	10,048	875,381,760	35,015,270
Barker	5	22.20	14,208	3,094,502,400	123,780,096
Valley	5	31.85	20,384	4,439,635,200	177,585,408
Totals		69.75	44,640	8,409,519,360	336,380,774
Upshur:					
Union	2	27.00	17,280	1,505,433,600	60,217,344
Washington	2	21.10	13,504	1,176,468,480	47,058,739
Banks	2	10.85	6,944	604,961,280	24,198,451
Totals		58.95	37,728	3,286,863,360	131,474,534
Randolph:					
Leadsville	5	5.00	3,200	696,960,000	27,878,400
Roaring Creek	2	25.00	16,000	1,393,920,000	55,756,800
Totals		30.00	19,200	2,090,880,000	83,635,200
Totals for Area		158.70	101,568	13,787,262,720	551,490,508

MINABLE COALS OF THE POTTSVILLE SERIES, KANAWHA GROUP.

UPPER MERCER COAL.

The Upper Mercer Coal, previously discussed in Chapter VIII, page 269, and shown by outcrop lines on Maps II and IV in those regions where it is of possible minable thickness, is of value principally in southern Upshur and western Randolph. In Barbour, it is found at outcrop or in borings at a few points along the Tygart Valley and a few openings have been made east of the Belington Syncline, where the Pottsville Series outcrops along the foot of the Laurel Ridge. This coal horizon, like the Clarion, is patchy, and uncertain, often containing too much slate and bone to permit of successful mining and often being absent entirely from the measures. It has furnished a considerable amount of domestic fuel but has not been mined commercially. Figure 12 shows its probable areal extent.

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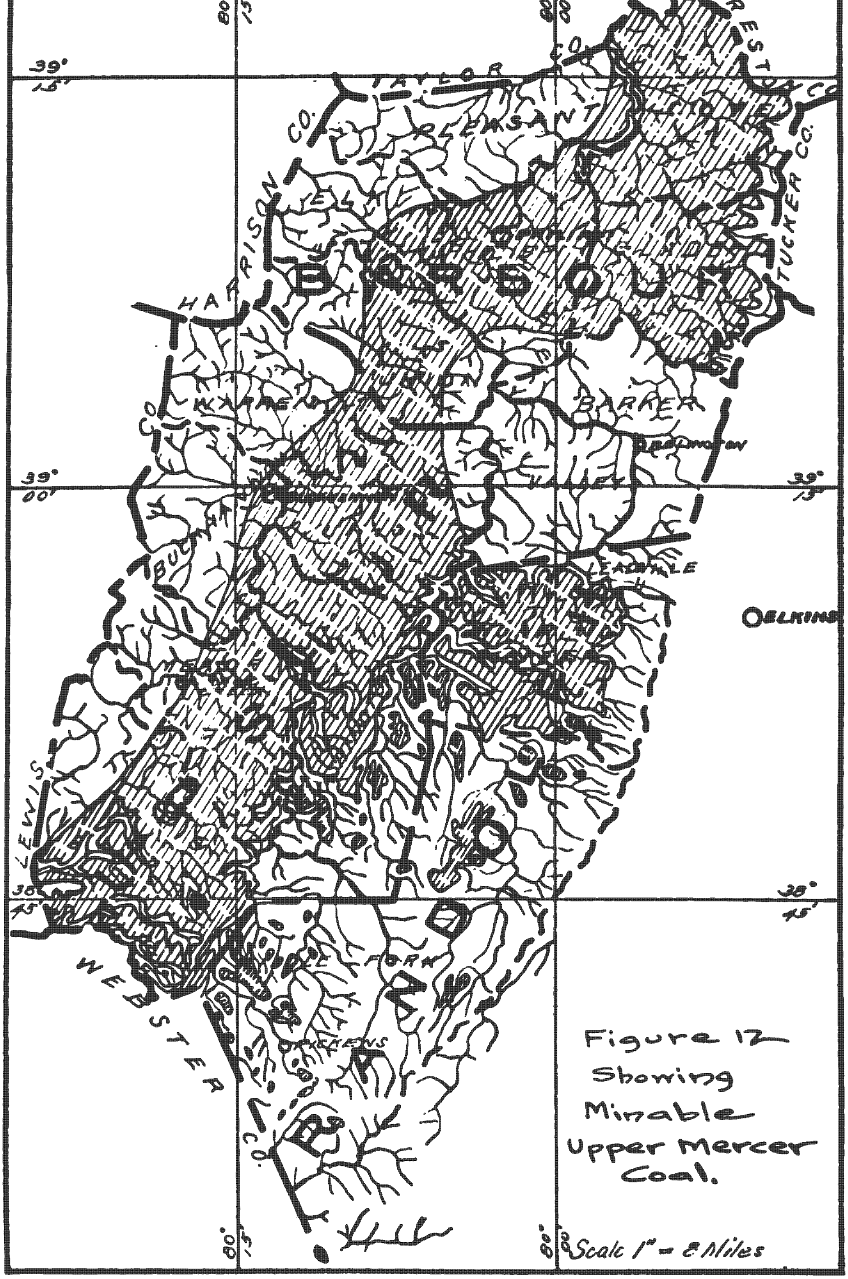

Figure 12 Showing Minable Upper Mercer Coal.

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Upper Mercer Coal, Union District, Barbour.

In Union District, a coal is visible at **Exposure No. 839 on Map II,** on the Tygart Valley River, 0.1 mile south of Tygart Junction, and just southeast of the mouth of Buckhannon River, that, as shown in detail by the section for Tygart Junction, page 99, is 2′ 4″ thick, coming just below the Homewood Sandstone, and at an elevation of 1335′ L., which apparently correlates with the Upper Mercer. It was not observed elsewhere in the District.

Upper Mercer Coal; Philippi District, Barbour.

In Philippi District, the Upper Mercer was not observed at outcrop, but the diamond drill boring made at Arden, published in connection with the section for that place, page 96, records 7′ 10″ of slate and coal, coming 94′ 11″ below the Lower Kittanning which is mined just above the top of the boring. This would represent the Upper Mercer Coal. It is also reported to have been prospected on the west side of the Tygart Valley about one mile below Arden, where access could be had to it at times of low water, having much the same thickness as in the boring.

Upper Mercer Coal, Glade District, Barbour.

Two openings in the Upper Mercer were observed in Glade District at the foot of Laurel Ridge, as follows:

Bishop Heirs Farm Mine—No. 840 on Map II.

On Teter Creek, 1.8 miles north of Kirt; Upper Mercer Coal; elevation, 1740′ B.

		Ft.	In.
Sandstone, massive, make falls in Teter Creek, at old mill, Homewood		25	0
Shale, sandy		10	0
Coal, soft, with sulphur bands	3′ 2″		
Coal, bony	0 4	3	6
Slate, pavement			

A. J. Harris Farm Mine—No. 841 on Map II.

On Teter Creek, 1.9 miles south of Kirt; Upper Mercer Coal; elevation, 1980′ B.

			Ft.	In.
Sandstone, massive, Homewood				
Concealed			30	0
Coal	0′	10″		
Slate, dark	2	0		
Coal, soft	2	0		
Coal, harder, bony	1	0	5	10

Upper Mercer Coal, Barker District, Barbour.

In Barker District, the following opening apparently represents the Upper Mercer, although its location is against the steep structural slope of the Laurel Ridge, making the correlation somewhat doubtful:

Joseph Fishwater Farm Mine—No. 842 on Map II.

On Hunter Fork of Sugar Creek, 3.2 miles northeast of Belington; Upper Mercer Coal; elevation, 2105′ B.

			Ft.	In.
Sandstone, massive, pebbly, Homewood				
Slate, sandy, 0′ 0″ to			2	0
Coal, good	1′	0″		
Coal, slaty	0	5	1	5
Slate, pavement				

Upper Mercer Coal, Union District, Upshur.

In Union District, scattered blossoms of the Upper Mercer were observed, the following being the only opening where a measurement could be secured, according to Teets:

Charles E. Hiner Farm Mine—No. 843 on Map IV.

On Left Fork of Sand Run, 1.7 miles southeast of Overhill; Upper Mercer Coal; elevation, 1706′ B.

			Ft.	In.
Slate				
Coal	0′	3″		
Coal, bony	0	5		
Coal, soft	1	10		

			Ft.	In.
Slate	0'	1"		
Coal, bony	0	2		
Coal, medium-hard	4	0	6	9
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 843** in the table of coal analyses at the end of this Chapter.

Upper Mercer Coal, Meade District, Upshur.

In Meade District, the Upper Mercer Coal was observed at a few points along the Buckhannon River, being usually slaty and impure, the following being noted:

At the **Baltimore and Ohio Railroad Coal Exposure (No. 844 on Map IV)**, located 0.2 mile northwest of Ours Mill, a coal is visible in the railroad cut, 1' 0" thick, at an elevation of 1470' B., being 64 feet, hand-level, below the Lower Kittanning, and apparently representing the Upper Mercer although the presence of a thick bed of flint fire clay just below it might indicate that the latter would represent the Mount Savage, or possibly the Hammond Fire Clay, and if so, the coal belongs at a higher horizon.

The following exposure was obtained at the well-known "Hanging Rock":

Baltimore and Ohio R. R. Exposure—No. 845 on Map IV.

On the Buckhannon River, 0.6 mile southeast of Ours Mill; Upper Mercer Coal; elevation, 1495' B.

			Ft.	In.
Sandstone, massive, "Hanging Rock", Homewood			50	0
Slate, black			15	0
Coal, bony	1'	6"		
Coal, soft	1	0		
Slate, black	2	0		
Coal	0	8	5	2
Fire clay, to grade			3	0

Baltimore and Ohio R. R. Exposure—No. 846 on Map IV.

On the Buckhannon River, 0.6 mile northwest of Tenmile; **Upper Mercer Coal**; elevation, 1600′ B.

			Ft.	In.
Sandstone, massive, **Homewood**			50	0
Slate, black			10	0
Coal	0′	4″		
Slate, black, bony	1	1		
Coal	0	6		
Slate, black	0	3		
Coal, bony	0	10	3	0
Slate, dark, to grade				

Upper Mercer Coal, Washington District, Upshur.

In Washington District, a few openings have been made in the Upper Mercer, principally along the Middle Fork River and its tributaries. The **Blaine Koon Farm Mine (No. 847 on Map IV)**, located on a branch of Right Fork of Middle Fork, 0.5 mile southwest of Queen, was reported 3′ 4″ thick, only 2′ 6″ being visible at the time it was examined by Teets, the tidal elevation being 2260′ B. The **H. A. Zickefoose Prospect (No. 848 on Map IV)**, located on a branch of Right Fork of Middle Fork, 2.6 miles south of Queen, showed 2 feet of coal at the time of Teets' visit, its elevation being 2515′ B., and the entire thickness not being visible. The **O. H. Fletcher Water Well**, drilled on the same branch, 2.8 miles south of Hemlock, is reported to have found 5 feet of coal at a depth of 90 feet, and this, according to Teets, correlates with the Upper Mercer, the tidal elevation of the coal being 2520′ B. The following exposure was noted in the public road near Hemlock:

Coal Exposure—No. 849 on Map IV.

On Right Fork of Middle Fork River, 0.8 mile southwest of Hemlock; **Upper Mercer Coal**; elevation, 2705′ L.

			Ft.	In.
Sandstone, massive, cliff rock, **Homewood**				
Concealed			13	0
Coal	1′	0″		
Fire clay	3	0		
Coal, 2′ 0″ to	3	0	7	0
Concealed				

The **Ephraim Wolf Farm Mine (No. 850 on Map IV),** located on a branch of the Right Fork of Middle Fork River, 1.2 miles northeast of Palace Valley, at an elevation of 2785′ B., had fallen shut, at the time of Teets' visit, and could not be measured. The section of the coal is exposed in full at the following opening, reported by Teets:

Sarah E. Hinkle Farm Mine—No. 851 on Map IV.

On Left Fork of Buckhannon River, 0.7 mile northeast of Palace Valley; **Upper Mercer Coal**; elevation, 2925′ B.

			Ft.	In.
Slate				
Coal	0′	3″		
Slate	1	2		
Coal	1	0		
Slate	0	6		
Coal	0	2		
Slate	0	2		
Coal	1	0	4	3
Slate, pavement				

Upper Mercer Coal, Banks District, Upshur.

In Banks District, the Upper Mercer has been opened at several points and has furnished some good fuel, occasionally being almost free from slate, the following openings having been noted along the waters of Little Kanawha River:

At **Farm Mine No. 852 on Map IV,** located on Cherry Fork of Little Kanawha River, 2.5 miles northeast of Ingo, the coal had once been mined by stripping, at an elevation of 1470′ B., but the place had fallen shut and could not be measured. It was once opened at the **Charity Riley Farm Prospect (No. 853 on Map IV),** on Cave Run of Little Kanawha, 1 mile southwest of Kanawha Head, at an elevation of 1655′ B., being reported 1′ 8″ thick, and coming 80 feet below the Lower Kittanning. The following measurement, made with hand-level, shows the relationship of the Upper Mercer to the Lower Kittanning in the Kanawha River region:

Ben Curry Prospect—No. 854 on Map IV.

On Little Kanawha River, at mouth of Lynncamp Run, 0.7 mile northwest of Kanawha Head; **Upper Mercer Coal**; elevation, 1635′ B.

				Thickness. Feet.	Total. Feet.
Sandstone, massive, **East Lynn**				6	6
Coal, with partings (See Mine No. 754, page 614), **Lower Kittanning**				4½	10½
Concealed				37½	48
Sandstone, massive, **Homewood**, partly concealed				36½	84½
Coal	2′	0″	**Upper Mercer**		
Slate, 0″ to	0	6	(2′ 10″)	3	87½
Coal	0	4	(1635′ B.)		
Concealed, with streaks of **coal**				15	102½

At the above opening in the Upper Mercer, only the upper bench, showing 2 feet of coal, was visible, the remainder being reported by Mr. Curry. From this point, the Homewood Sandstone ledge can be followed by eye northeastward three-fourths mile around the mountain to the following opening that has been made directly underneath the ledge and that apparently represents a much finer development of the Upper Mercer than can be found anywhere else in the three counties:

John McKissic Farm Mine—No. 855 on Map IV.

On Lynncamp Run, 0.6 mile north of Kanawha Head; **Upper Mercer Coal**; butts, N. 88° W.; elevation, 1620′ B.

				Ft.	In.
1.	Sandstone, massive, cliff rock, **Homewood**			30	0
2.	Slate, black, bony			0	3
3.	**Coal**, splinty	4′	2″		
4.	**Coal**, bony	0	3		
5.	**Coal**, splinty	3	11		
6.	Slate, dark, soft	0	2		
7.	**Coal**	0	7		
8.	**Coal** (?), to bottom of hole in floor of mine (full of water)	1	1	10	2

A sample was collected from Nos. 3 and 5 of section, the composition of which is published under **Mine No. 855** in the table of coal analyses at the end of this Chapter. The analysis shows a remarkably pure coal, low in sulphur, phosphorus, and ash. The fact that the same seam apparently breaks up into thin streaks of coal separated by slates as shown by the

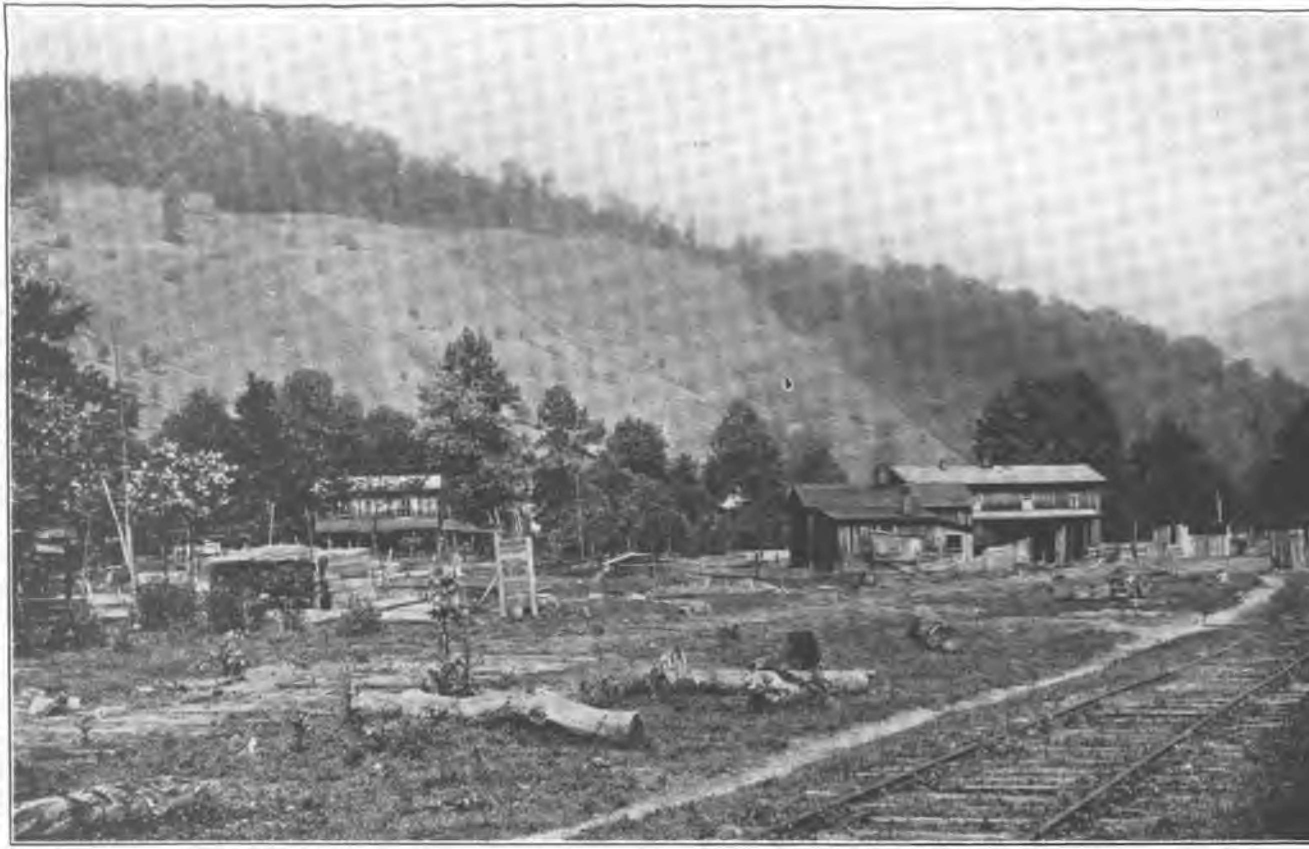

PLATE XXXVIII.—Characteristic topography of the Pottsville Series, looking north from Cassity, on Middle Fork Riv Randolph County.

Curry prospect above (No. 854), which appears to represent its typical nature in this region, detracts much from the value of this bed as shown by the measurement and test of the McKissic opening.

The coal was once opened at the **Grant Wilson Prospect (No. 856 on Map IV)**, on the Little Kanawha River, 1 mile southwest of Arlington, at an elevation of 1530′ B. The place had fallen shut, only 1½ feet of cannel slate being visible at the top, the thickness of the coal being reported 7 feet by Mr. Wilson.

John Lane Farm Mine—No. 857 on Map IV.

On Laurel Run of Little Kanawha, 0.6 mile east of Arlington; Upper Mercer Coal; elevation, 1540′ B.

			Ft.	In.
Slate, black				
Coal	0′	4″		
Slate, black	1	0		
Coal	2	0		
Slate, black	0	3		
Coal, visible	1	0	4	7
Concealed				

George Wilson Prospect—No. 858 on Map IV.

On a branch of Laurel Run of Little Kanawha, 0.8 mile east of Arlington; Upper Mercer Coal; elevation, 1545′ B.

			Ft.	In.
Slate, black			6	0
Coal and bone, mixed	1′	8″		
Coal	0	4		
Bone	0	2		
Coal, hard	1	0		
Slate, hard	0	6		
Coal	1	3	4	11
Slate, pavement				

The **Grant Wilson Farm Mine (No. 858A on Map IV)**, located on the Little Kanawha River, 0.2 mile southwest of Stillman, measured 3′ 7″ of clean coal, at an elevation of 1530′ B.

Upper Mercer Coal, Roaring Creek District, Randolph.

In Roaring Creek District, only a few openings in the Upper Mercer were noted. At the **Coal and Coke Railway Exposure (No. 859 on Map IV)**, located on the Tygart Valley River, 0.5 mile northwest of Leiter, at an elevation of 1890′ B., the coal is visible in the railroad cut, coming 20 feet below the great Homewood cliff and having a variable thickness of 3 to 5 feet, with partings.

The **Pat Ford Farm Mine (No. 860 on Map IV)**, located on Laurel Creek of Middle Fork River, at the old "Half-Way House", 1.4 miles west of Pumpkintown, showed 5′ 3″ of coal and slate, as exhibited in detail in the section for Pumpkintown, page 167, its elevation being 2350′ B.

Upper Mercer Coal, Middle Fork District, Randolph.

The Upper Mercer Coal has been opened at a few points in Middle Fork District and in these it preserves its usual character, having alternate layers of coal and slate. The three following openings were noted by Teets on the waters of Middle Fork River:

Maxwell, Arnold, et al. Farm Mine—No. 861 on Map IV.

On Cassity Fork of Middle Fork River, 2.8 miles northeast of Cassity; Upper Mercer Coal; elevation, 2535′ B.

			Ft.	In.
Slate, cannel			1	4
Coal, soft	0′	9″		
Slate, black, 3″ to	0	6		
Coal, soft	1	0		
Slate, gray	0	7		
Coal, soft, visible	1	0	3	10
Concealed by water				

A sample was collected from this opening, the composition of which is published under **Mine No. 861** in the table of coal analyses at the end of this Chapter.

Moore-Keppel & Company Farm Mine—No. 861A on Map IV.

On a branch of Cassity Fork, 1.2 miles southeast of Cassity; **Upper Mercer Coal**; elevation, 2630′ B.

			Ft.	In.
Slate, cannel				
Coal, bony	0′	9″		
Slate, black	0	10		
Coal	0	8		
Shale, gray	0	7		
Coal	1	10		
Coal, reported	0	8	5	4

A sample was collected from this opening, the composition of which is published under **Mine No. 861A** in the table of coal analyses at the end of this Chapter.

The **Taylor George Prospect (No. 861B on Map IV)**, located on Panther Run, 2.1 miles southeast of Cassity, at an elevation of 2640′ B., had fallen shut and could not be measured.

On the waters of Buckhannon River, several openings have been made. The **Ernest Pouli Farm Mine (No. 862 on Map IV)**, located on Left Fork of Right Fork, 0.7 mile northwest of Helvetia, at an elevation of 2730′ B., had fallen shut, but was reported 3 to 4 feet thick. The **J. A. McCauley Farm Mine (No. 863 on Map IV)**, located on Right Fork of Buckhannon River, 0.4 mile north of Silica, measured 3′ 4″ of clean, soft coal, as shown in the section for Silica, page 181, its elevation being 2750′ B., and its position 3 feet below the great Homewood cliff rock. **Coal Prospect No. 864 on Map IV**, located on Right Fork of Buckhannon River, 0.7 mile east of Silica, had fallen shut, its elevation being 2920′ B., and its position apparently just below the Homewood cliff. The **John McCauley Farm Mine (No. 865 on Map IV)**, located on the south side of Right Fork of Buckhannon River, 0.6 mile southwest of Silica, had fallen shut when visited, its thickness being reported as 6 feet, and its elevation being 2795′ B. The **Andrew Balli Farm Mine (No. 866 on Map IV)**, located on Devil Fork of Buckhannon River, 2.5 miles northwest of Pickens, at an elevation of 2965′ B., had been abandoned, but, according to Mr. Balli, showed about 3 feet of coal. The coal was once opened in the top of Turkeybone Mountain, at the head of a branch of Right Fork of Buckhannon River, 1.8 miles southeast of Pickens, at the **James Pickens Heirs Prospect (No. 867 on Map IV)**, at an elevation of 3670' B., and coming just below the massive, pebbly Homewood Sandstone, which caps the knob, and is responsible for its present height above the surrounding ridges. The thickness of the coal at this point was not learned. Southwestward from the knob last mentioned, the Homewood Sandstone appears in two or three other sharp points and in one of these was once opened by L. M. and John Hull on what is now the Robert Hull land. The opening had fallen shut, the following section being reported by L. M. Hull:

Robert Hull Farm Mine—No. 868 on Map IV.

On Bee Knob, at the head of Right Fork of Buckhannon River, 2.7 miles south of Pickens; Upper Mercer Coal; elevation, 3530' B.

			Ft.	In.
Coal, thickness unknown				
Shale, gray	2'	0"		
Coal	2	0	4	0

The great, coarse, massive Homewood ledge caps the knob immediately above this old opening.

Quantity of Upper Mercer Coal Available.

In addition to the coal openings described on the preceding pages, the accompanying table shows a list of oil and gas wells that record the Upper Mercer Coal in the region where its horizon is under drainage. Its presence is also recorded in a few of the diamond drill borings, published on previous pages of this Chapter. Another table is added showing the probable amount of this coal by magisterial districts, the areal extent of which was measured with planimeter by Tucker according to the surface and underground areas outlined for it on Maps II and IV and Figure 12.

List of Oil and Gas Wells Recording Upper Mercer Coal.

No. on Map.	Name of Well.	Location.	Elevation of well mouth. A. T.	Depth to Coal.	Thickness. Feet.
	Barbour County:				
9	Julia Hall No. 1.........	Elk City, 1.5 mi. N. W..	1048L	545	5
16	L. D. Kerr No. 1.........	Boulder, 0.4 mi. S. W..	1380B	137	5
17	E. D. Talbott Hrs. No. 2...	Philippi, 0.5 mi. W....	1414L	277	7
	Upshur County:				
41	Isaac S. Reger No. 1.....	Ruraldale, 2.1 mi. W...	1075B	693	4
42	Wm. Post No. 1..........	Buckhannon, 3 mi. N..	1410	795	10(?)
53	L. J. Lewis No. 1.........	Abbott, 1.6 mi. N. E...	1505L	584	2
55	A. F. Moreland No. 1....	Hinkle, 1.5 mi. S. E....	1700B	40	.....
58	Geo. Burner No. 1.......	Sago	1432L	41	9(?)
84	Silica Sand Co. No. 3.	Craddock, 0.3 mi. N. W.	2505B	59	6

Probable Amount of Upper Mercer Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Ciol.
Barbour:					
Pleasant	3	5.75	3,680	480,902,400	19,236,096
Elk	3	6.70	4,288	560,355,840	22,414,234
Union	3	23.45	15,008	1,961,245,440	78,449,818
Philippi	3	39.15	25,056	3,274,318,080	130,972,723
Cove	3	51.40	32,896	4,298,849,280	171,953,971
Glade	3	43.45	27,808	3,633,949,440	145,357,978
Totals......	....	169.90	108,736	14,209,620,480	568,384,820
Upshur:					
Warren	3	8.20	5,248	685,808,640	27,432,346
Buckhannon ...	3	7.75	4,960	648,172,800	25,926,912
Union	3	42.00	26,880	3,512,678,400	140,507,136
Meade	3	39.45	25,248	3,299,408,640	131,976,346
Washington	3	42.90	27,456	3,587,950,080	143,518,003
Banks	3	48.20	30,848	4,031,216,640	161,248,665
Totals......	....	188.50	120,640	15,765,235,200	630,609,408
Randolph:					
Roaring Creek..	3	38.00	24,320	3,178,137,600	127,125,504
Middle Fork....	3	11.50	7,360	961,804,800	38,472,192
Totals......	....	49.50	31,680	4,139,942,400	165,597,696
Totals for Area....	....	407.90	261,056	34,114,798,080	1,364,591,924

LOWER MERCER (STOCKTON) COAL.

The Lower Mercer Coal of Pennsylvania, or Stockton of the Great Kanawha Valley of West Virginia, previously discussed in Chapter VIII, page 271, and shown by outcrop lines on Map IV in those regions where it is of possible minable thickness, is of value principally in the southeastern end of Banks District, Upshur, and in the adjoining portion of Middle Fork District, Randolph. In this region it is a good, pure coal, about 4 feet thick, having hard splinty layers similar to the coals of the Great Kanawha Valley, and is mined for local domestic use with satisfactory results. Figure 13 shows its probable areal extent.

Lower Mercer (Stockton) Coal, Washington District, Upshur

The Lower Mercer was not observed in minable thickness in Washington District, but at **Coal Exposure No. 869 on Map IV**, on the Right Fork of Middle Fork River, 0.7 mile southwest of Hemlock, its blossom is visible in the public road, immediately under the fossiliferous Kanawha Black Flint shale.

Lower Mercer (Stockton) Coal, Banks District, Upshur.

The Lower Mercer has been opened at a few points along the Buckhannon River, the following being noted:

David Shaw Farm Mine—No. 870 on Map IV.

On Bens Run of Buckhannon River, 0.7 mile northwest of Selbyville; Lower Mercer (Stockton) Coal; elevation, 2250′ B.

	Ft.	In.
Slate, dark		
Coal, medium-hard	3	6
Slate, pavement		

The **Silica Sand Company Mine (No. 871 on Map IV)**, located on the Buckhannon River, 0.4 mile west of Craddock, at an elevation of 2390′ B., measured 3′ 0″ of clean coal. This opening was formerly worked for the use of the sand plant, but is now abandoned. A sample was collected from the old

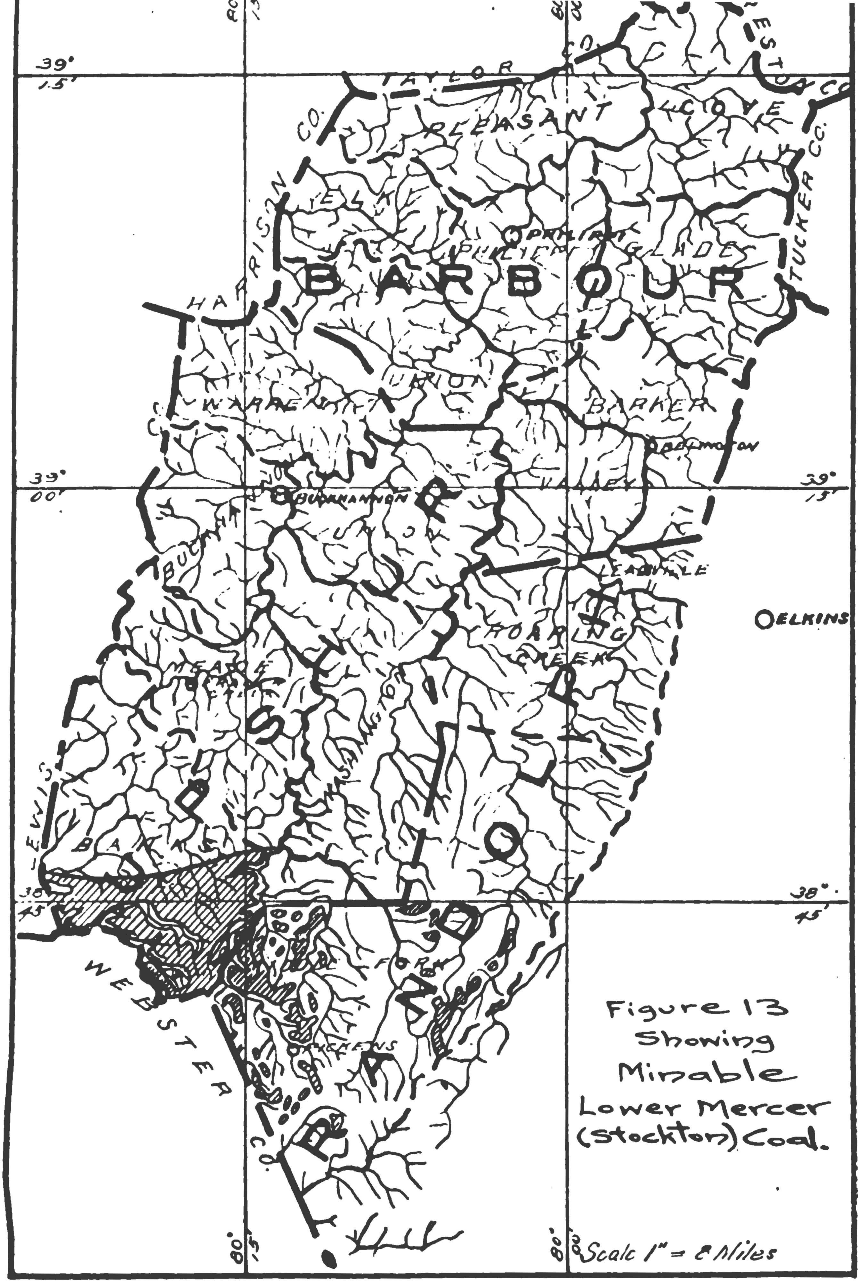

Figure 13
Showing
Minable
Lower Mercer
(Stockton) Coal.

Google

opening, the composition of which is published under **Mine No.** 871 in the table of coal analyses at the end of this Chapter. Another opening on the same property shows the following:

Silica Sand Company Prospect—No. 872 on Map IV.

On Hell Run of Buckhannon River, 0.7 mile southwest of Craddock; **Lower Mercer (Stockton) Coal**; elevation, 2470' B.

			Ft.	In.
Sandstone, massive, **Homewood**, and concealed			50	0
Shale, dark			5	0
Coal, slaty	1'	2"		
Coal, splinty	0	9		
Bone	0	1		
Coal	1	3	3	3
Slate, pavement				

Several openings have been made on the waters of the Little Kanawha. The following seems to represent the Lower Mercer although it may be the Upper Mercer instead:

G. S. Andrew Farm Mine—No. 873 on Map IV.

On Panther Fork, 1.5 miles northeast of Ingo; **Lower Mercer (Stockton) Coal**; elevation, 1495' B.

			Ft.	In.
Slate, dark			2	0
Coal			0	1
Slate, black			1	0
Coal, soft	0'	6"		
Coal, bony	0	5		
Slate, dark	0	5		
Coal, bony	1	3		
Coal, soft	0	3	2	10
Slate, pavement, and concealed, to massive sandstone			5	0

Edward H. Peck Farm Mine—No. 874 on Map IV.

On Pecks Run of Little Kanawha River, 1 mile northwest of Craddock; **Lower Mercer (Stockton) Coal**; elevation, 2315' B.

			Ft.	In.
Shale, sandy			10	0
Coal	1'	5"		
Slate, black	0	3		
Coal	2	2		
Slate, black	0	2		
Coal, visible	1	0	5	0
Concealed				

R. B. Rexroad Farm Mine—No. 875 on Map IV.

On Little Kanawha River, 0.2 mile northeast of Canaan; Lower Mercer (Stockton) Coal; elevation, 2175′ B.

			Ft.	In.
Sandstone, massive				
Coal	0′	4″		
Slate, black, lenticular	1	0		
Coal	1	0		
Coal, reported	2	0		
Slate, black, reported	1	3		
Coal, reported	4	0		
Coal, bony, reported	0	6	10	1

The above opening had nearly fallen shut, Mr. Rexroad being authority for the lower members of the section.

The **Herbert Bellingham Farm Mine** (No. 876 on Map IV), located on the Little Kanawha, 0.2 mile southeast of Canaan, at an elevation of 2205′ B., measured 3′ 4″, as shown in detail in the section for Canaan, page 151:

Jacob Arbogast Farm Mine—No. 877 on Map IV.

On Little Kanawha River, 0.5 mile southeast of Canaan; Lower Mercer (Stockton) Coal; elevation, 2245′ B.

			Ft.	In.
Sandstone, massive				
Coal, Upper Mercer			1	6
Concealed			5	0
Slate, dark, with plant fosils			5	0
Coal	1′	7″		
Coal, hard, bony	0	4		
Coal	1	6	3	5
Slate, pavement				

John Thomas Farm Mine—No. 878 on Map IV.

On Little Kanawha River, 1 mile southeast of Canaan; Lower Mercer (Stockton) Coal; butts, N. 86° E.; elevation 2325′ B.

			Ft.	In.
1. Slate, dark			2	0
2. Coal, splinty	2′	0 ″		
3. Slate, black	0	0½		
4. Coal, splinty	1	3½	3	4
5. Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 878** in the table of coal analyses at the end of this Chapter.

William Waugh Farm Mine—No. 879 on Map IV.

On Little Kanawha River, 1.1 miles southeast of Canaan; **Lower Mercer (Stockton) Coal**; elevation, 2330' B.

			Ft.	In.
Shale, dark, sandy			5	0
Coal	2'	1"		
Slate, black	0	3		
Coal	2	4	4	8

Hanson Friend Heirs Farm Mine—No. 880 on Map IV.

On Middle Fork of Little Kanawha River, 0.9 mile northeast of Goshen; **Lower Mercer (Stockton) Coal**; elevation, 2285' B.

			Ft.	In.
Slate, dark			4	0
Coal, soft	1'	5"		
Coal, splint	1	1		
Slate, black, soft	0	3		
Coal, medium-hard	1	4	4	1
Slate, pavement				

Grant Sines Farm Mine—No. 881 on Map IV.

On a branch of Middle Fork of Little Kanawha River, 0.7 mile northeast of Goshen; **Lower Mercer (Stockton) Coal**; elevation, 2355' B.

			Ft.	In.
Sandstone, massive				
Coal, medium-hard	1'	7"		
Slate, gray	0	1		
Coal, splint	0	5		
Slate, dark, soft	0	5		
Coal, splinty	1	8	4	2
Slate, pavement				

Josephus Sines Farm Mine—No. 882 on Map IV.

On Howell Fork of Right Fork of Little Kanawha River, 0.7 mile southwest of Goshen; **Lower Mercer (Stockton) Coal**; elevation, 2130' B.

			Ft.	In.
Slate, black				
Coal	2'	2"		
Bone	0	3		
Coal	2	4	4	9

Troy Hardman Farm Mine—No. 883 on Map IV.

On Howell Fork of Right Fork of Little Kanawha River, 0.6 mile southwest of Goshen; Lower Mercer (Stockton) Coal; elevation, 2195' B.

			Ft.	In.
Sandstone, massive				
Concealed and black slate			2	0
Coal, slaty	0'	10"		
Slate, black	0	5		
Coal	3	4	4	7
Slate, pavement?				

Lower Mercer (Stockton) Coal, Roaring Creek District, Randolph.

The Lower Mercer Coal was not observed in minable quantity in Roaring Creek District, but a coal appears in a few of the railroad cuts west of Leiter that apparently represents it, the following being one of these exposures:

Coal and Coke Railway Exposure—No. 884 on Map IV.

On Laurel Run of Tygart Valley River, 0.4 mile southwest of Findley; Lower Mercer (Stockton) Coal; elevation, 1950' B.

			Ft.	In.
Sandstone, massive, top portion of Upper Connoquenessing cliff				
Slate, black			7	0
Coal, bony	0'	11"		
Slate, black	1	0		
Coal	1	0	2	11
Shale, to grade				

Lower Mercer (Stockton) Coal, Middle Fork District. Randolph.

A few exposures of the Lower Mercer were noted in the northwestern corner of Middle Fork District, on the waters of Buckhannon River. At **Coal Exposure No. 885 on Map IV,** located on the ridge west of Left Fork of Right Fork of Buckhannon, 1.1 miles north of Helvetia, Teets noted 1' 8" of coal in the public road, at an elevation of 2635' B.

R. T. Evans Farm Mine—No. 886 on Map IV.

On a branch of Marsh Fork of Buckhannon River, 1.3 miles southwest of Silica; Lower Mercer (Stockton) Coal; elevation, 2880′ B.

			Ft.	In.
Slate, dark				
Coal, splinty	2′	2″		
Coal, softer	0	10	3	0
Slate, pavement				

Andrew Balli Farm Mine—No. 887 on Map IV.

On Devil Fork of Buckhannon River, 1.8 miles southwest of Silica; Lower Mercer (Stockton) Coal; elevation, 2890′ B.

			Ft.	In.
1. Shale, dark				
2. Coal, splint	2′	2″		
3. Coal, softer	0	9	2	11
4. Slate, pavement				

A sample was collected from Nos. 2 and 3 of section, the composition of which is published under **Mine No. 887** in the table of coal analyses at the end of this Chapter.

The following opening is reported by Teets on Little Sugar Creek, tributary to the Elk River drainage system:

Bird Casto Farm Mine—No. 887A on Map IV.

On Little Sugar Creek, 2.3 miles southwest of Pickens; Lower Mercer (Stockton) Coal; elevation, 3330′ B.

			Ft.	In.
Slate, black				
Coal	0′	11″		
Slate, gray	0	10		
Coal	0	6		
Slate, or bony coal	0	3		
Coal	1	1		
Slate	0	1		
Coal	0	2	3	10
Slate, pavement				

Quantity of Lower Mercer (Stockton) Coal Available.

In addition to the coal openings described on the previous pages, the accompanying table shows a list of oil and gas wells that record coal at what appears to be the Lower Mercer horizon in regions where it belongs under drainage. Another table is added showing the probable amount of this coal by magisterial districts, the areal extent of which was measured with planimeter by Tucker according to the surface and underground areas outlined for it on Map IV and Figure 13.

List of Oil and Gas Wells Recording Lower Mercer (Stockton) Coal.

No. on Map.	Name of Well.	Location.	Elevation of well mouth. A. T.	Depth to Coal. Feet.	Thickness. Feet.
	Barbour County:				
9	Julia Hall No. 1.........	Elk City, 1.5 mi. N. W..	1048L	565	5
	Upshur County:				
84	Silica Sand Co. No. 8....	Craddock, 0.3 mi. N. W.	2505B	135	7

Probable Amount of Lower Mercer (Stockton) Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Upshur:					
Banks	3	28.40	18,176	2,375,239,680	95,009,587
Randolph:					
Middle Fork........	3	10.30	6.592	861,442,560	34,457,702
Totals for Area.........		38.70	24,768	3,236,682,240	129,467,289

QUAKERTOWN (COALBURG? OR WINIFREDE?) COAL.

The Quakertown Coal, previously discussed in Chapter VIII, page 274, and shown by outcrop lines on Maps II and IV, in those regions where it may eventually be classed as minable, seems to be of value principally in Washington District, Upshur, although it was noted in several other localities. As stated at the reference above, its exact correlation with the expanded column of the Great Kanawha Valley is not definitely known, although it seems to represent either the Coalburg or Winifrede horizon. In the territory of this Report, it seldom exceeds 2 feet in thickness, being usually represented only by a blossom. Figure 14 shows its probable areal extent as an economic asset.

Quakertown Coal, Valley District, Barbour.

In Valley District, the following opening seems to represent the Quakertown:

Farm Mine—No. 888 on Map II.

On Laurel Run of Tygart Valley River, 0.8 mile southwest of Skidmore; Quakertown Coal; elevation, 1885′ B.

			Ft.	In.
Coal digging, abandoned, Quakertown "Rider" Coal				
Sandstone, massive			5	0
Slate, dark, Quakertown			5	0
Shale, hard, sandy			5	0
Coal, soft	1′	5″		
Slate, bony	0	4		
Coal, hard	0	6	2	3
Slate, pavement, and concealed			10	0
Sandstone, massive			.	

Quakertown Coal, Meade District, Upshur.

In Meade District, the Quakertown was observed at a few points along the Buckhannon River, between Tenmile and Alexander. At the **Baltimore and Ohio Railroad Exposure (No. 889 on Map IV)**, located 0.7 mile north of Beans Mill. the coal is 1 foot thick, at an elevation of 1745′ B., and coming just below the Upper Connoquenessing cliff. At the **Baltimore and Ohio Railroad Exposure (No. 890 on Map IV)**, located 0.5 mile north of Beans Mill, it is 1 foot thick and slaty, having an elevation of 1765′ B., and coming 7 feet below the cliff, and 7 feet above railroad grade. At **Coal Exposure No. 891 on Map IV**, 1.1 miles southeast of Alton, the coal is

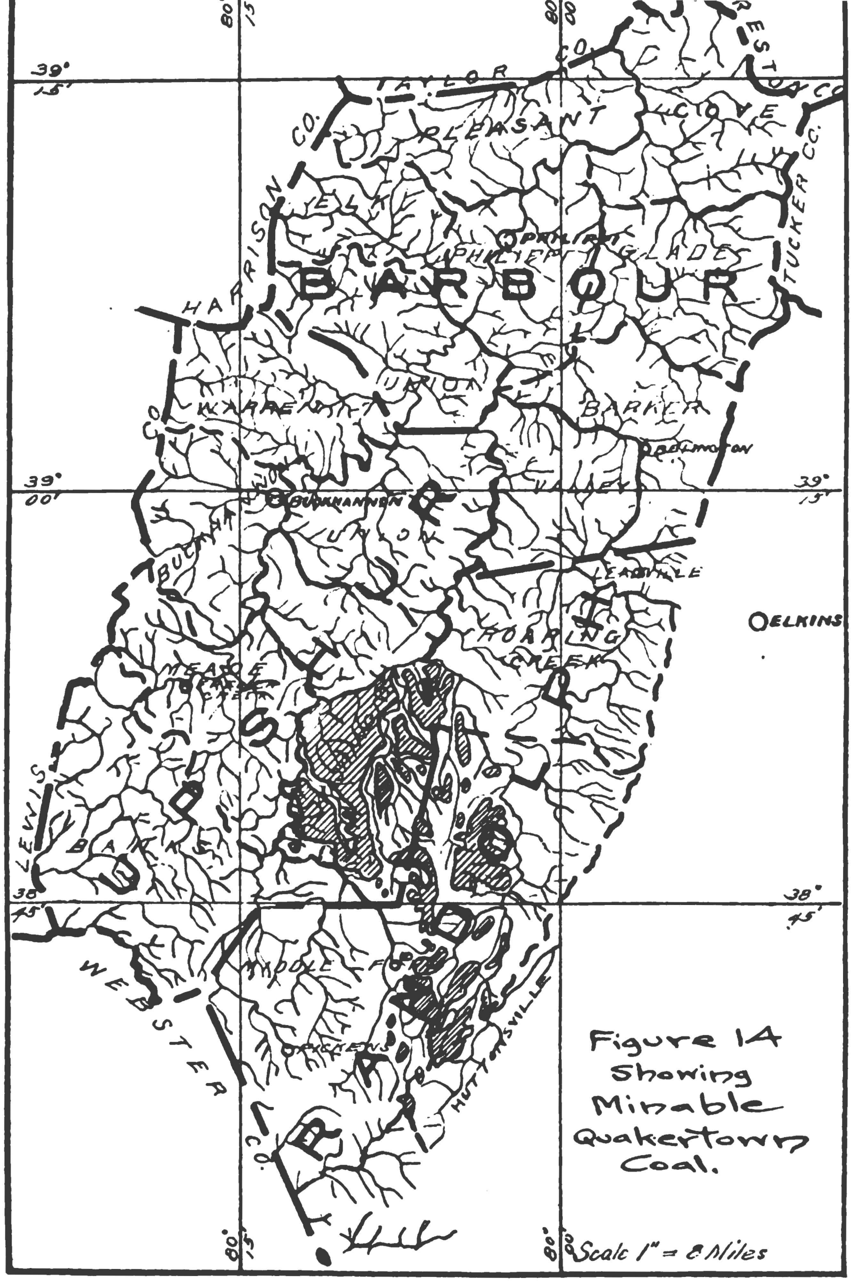

Figure 14
Showing
Minable
Quakertown
Coal.

reported in the bed of the river by William Taylor, its elevation being 1810′ B., and its thickness unknown.

Quakertown Coal, Washington District, Upshur.

In Washington District, the coal has been opened at various points along Middle Fork River. At the **James O. Osborne Prospect (No. 892 on Map IV)**, located on the west side of the river at Gale, the coal was found in a spring where its thickness was concealed by water, but was reported 1′ 6″, the elevation being 1915′ B. At the **Joseph Hornbeck Prospect (No. 893 on Map IV)**, located just south of the forks of Middle Fork, and 1 mile east of Kedron, at an elevation of 1970′ B., the coal had once been opened but the place had fallen shut and its thickness was not learned. Several other openings farther up the Right Fork were reported by Teets, as follows:

The **Edwin Asper Farm Mine (No. 894 on Map IV)**, located on Right Fork, 0.7 mile southeast of Queen, at an elevation of 2130′ B., measured 2′ 7″ of soft coal. The **David Gooden Farm Mine (No. 895 on Map IV)**, located on Right Fork, 0.8 mile southeast of Queen, at an elevation of 2135′ B., measured 2′ 7″ of coal. At **Coal Exposure No. 896 on Map IV**, located 1.3 miles south of Queen, the coal crops in the road at an elevation of 2160′ B., with a thickness of about 3 feet. The **R. F. Cody Farm Mine (No. 897 on Map IV)**, located on Right Fork, 1.8 miles southwest of Queen, measured 1′ 6″ of coal, at an elevation of 2250′ B. The **Simon Hoover Farm Mine (No. 898 on Map IV)**, located on Jenks Fork, 1 mile northeast of Hemlock, was full of water but had an estimated thickness of 2′ 3″ of soft coal, its elevation being 2590′ B. The **H. A. Zickefoose Farm Mine (No. 899 on Map IV)**, located on Right Fork at the west edge of Hemlock, at an elevation of 2950′ B., had a total thickness of 2′ 10″, as shown in detail in the section for Hemlock, page 146. A sample was collected from this opening, the composition of which is published under **Mine No. 899** in the table of coal analyses at the end of this Chapter. The **Robert Pomp Farm Mine (No. 900 on Map IV)**, located on Right Fork, 1 mile southeast of

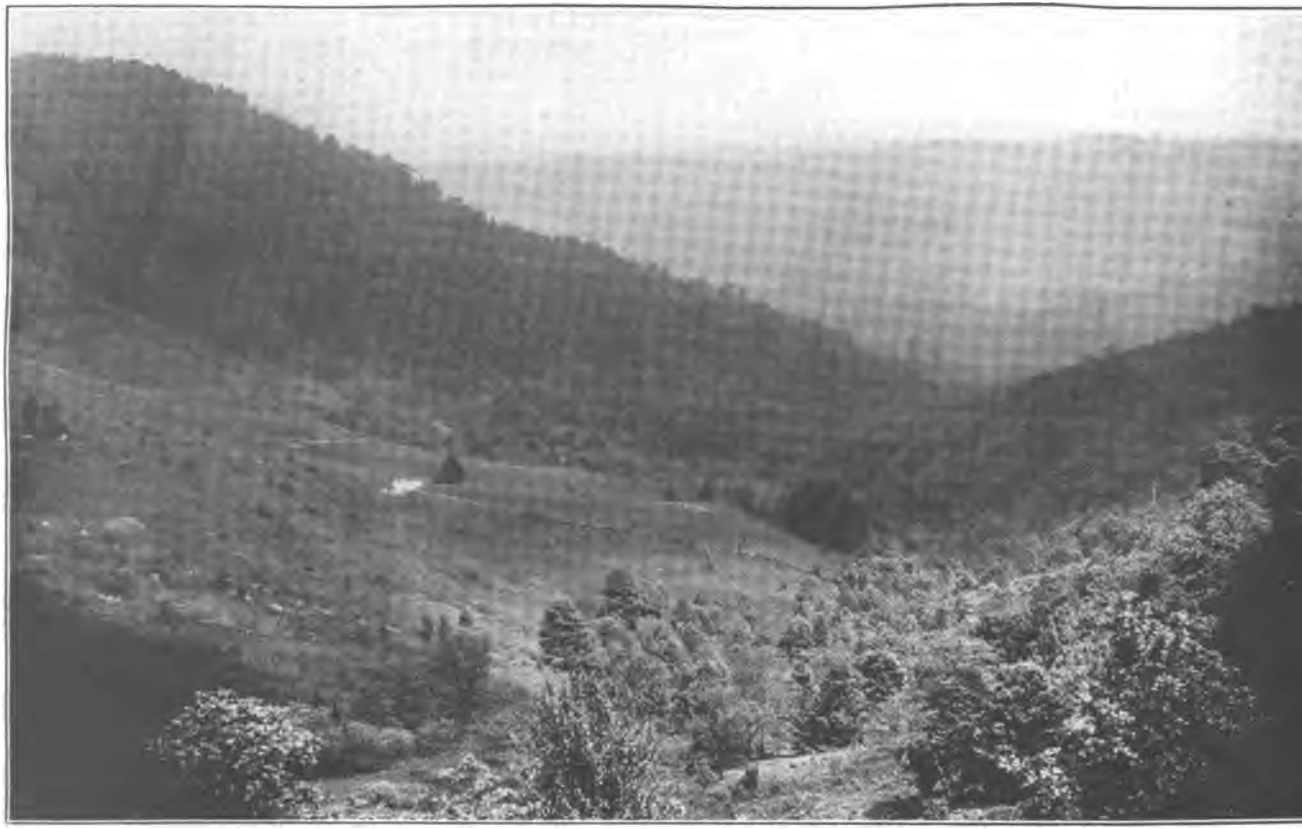

PLATE XXXIX.—Looking north down Lost Run from point in county road, 1.7 miles west of Cassity, Randolph Cou
showing topography of Pottsville Series.

Hemlock, at an elevation of 2805′ B., had fallen shut and its thickness was not learned.

Ephraim Wolf Farm Mine—No. 901 on Map IV.

On Right Fork of Middle Fork River, 1.3 miles northeast of Palace Valley; **Quakertown Coal**; elevation, 2720′ B.

			Ft.	In.
Slate				
Coal	2′	0″		
Slate	0	1		
Coal	0	6	2	7
Slate, pavement				

Quakertown Coal, Leadsville District, Randolph.

No coal of economic importance appears to be present at the Quakertown horizon in Leadsville District, but at **Exposure No. 902 on Map IV,** located on the Tygart Valley River, 0.3 mile south of Laurel Station, the coal is visible in the railroad cut, being 0′ 6″ thick, and having an elevation of 1780′ B.

Quakertown Coal, Roaring Creek District, Randolph.

In Roaring Creek District, the Quakertown was noted at the **James Ford Farm Mine (No. 903 on Map IV),** located on Laurel Creek of Middle Fork River, 1 mile west of Pumpkintown, at an elevation of 2270′ B. This opening had fallen shut and its thickness was not reported.

Quakertown Coal, Middle Fork District, Randolph.

In Middle Fork District, the Quakertown was noted at only a few points. It is reported by Teets at **Coal Exposure No. 904 on Map IV,** on Crislip Run of Buckhannon River, 1.6 miles southeast of Newlon, having an elevation of 2500′ B., and a thickness of 1′ 8″, as visible along the public road. At **Prospect No. 904A on Map IV,** located on Hooker Run of Buckhannon River, 0.4 mile north of Fairview, it was once opened at an elevation of 2705′ B., but the place had fallen shut and could not be measured.

The following opening is somewhat isolated from other mines in the Quakertown, but, according to Teets, it comes 110 feet below the top of the Upper Connoquenessing Sandstone, making it seem to correlate with the Quakertown horizon:

Elias Zickefoose Farm Mine—No. 905 on Map IV.

On Birch Fork of Left Fork of Middle Fork River, 1.4 miles northwest of Adolph; Quakertown Coal; elevation, 2910′ B.

			Ft.	In.
Slate, cannel..				
Coal	1′	0″		
Slate, black	0	3		
Coal	1	9	3	0
Slate, pavement				

Quantity of Quakertown Coal Available.

In addition to the coal openings described on previous pages, the Quakertown is represented in the Julia Hall No. (9) oil well, located in Elk District, Barbour, the coal having been found at a depth of 650 feet, and showing a thickness of 2 feet. The following table shows the probable amount of this coal by magisterial districts, the areal extent of which was measured with planimeter by Tucker according to the regions outlined for it on Maps II and IV and Figure 14:

Probable Amount of Quakertown Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Upshur:					
Washington	2	26.80	17,152	1,494,282,240	59,771,290
Randolph:					
Roaring Creek	2	1.50	960	83,635,200	3,345,408
Middle Fork	2	13.60	8,704	758,292,480	30,331,699
Huttonsville	2	0.85	544	47,393,280	1,895,731
Totals		15.95	10,208	889,320,960	35,572,838
Totals for Area		42.75	27,360	2,383,603,200	95,344,129

CAMPBELL CREEK (NO. 2 GAS) COAL.

The Campbell Creek (No. 2 Gas) Coal, previously discussed in Chapter VIII, pages 278-279, and shown by outcrop on Map IV, in those regions where it seems to be of value, is of minable thickness in the southeastern corner of Upshur and in parts of Roaring Creek and Middle Fork Districts, Randolph. In Barbour, it does not appear to have minable thickness although its horizon has been doubtfully recognized at a few points. This seam has a thickness of 2 to 3 feet in the Pickens region where it is best developed and is a good pure coal, low in ash, sulphur, and phosphorus. It appears to have the necessary qualities for making by-product coke. Figure 15 shows its probable areal extent as a minable seam.

Campbell Creek [No. 2] Gas Coal, Philippi District, Barbour.

In Philippi District, no coal of minable thickness was found at the Campbell Creek horizon, but a few exposures of a thin seam that appears to represent it were found along the Tygart Valley River where the Hiram Anticline brings the lower rocks of the Kanawha Group above drainage, the following being noted:

Coal Exposure—No. 913 on Map II.

On the Tygart Valley River, 0.6 mile northwest of Adma; Campbell Creek (No. 2 Gas) Coal; elevation, 1410' B.

	Ft.	In.
Sandstone, massive	40	0
Slate, sandy, with Lingulae fossils	5	0
Coal	1	0
Fire clay	5	0
Slate, black	5	0

At **Coal Exposure No. 914 on Map II,** located in the hollow just northeast of Adma Station, the coal measured 1' 0" thick, at an elevation of 1500' B., as shown in detail in the section for Adma, page 100.

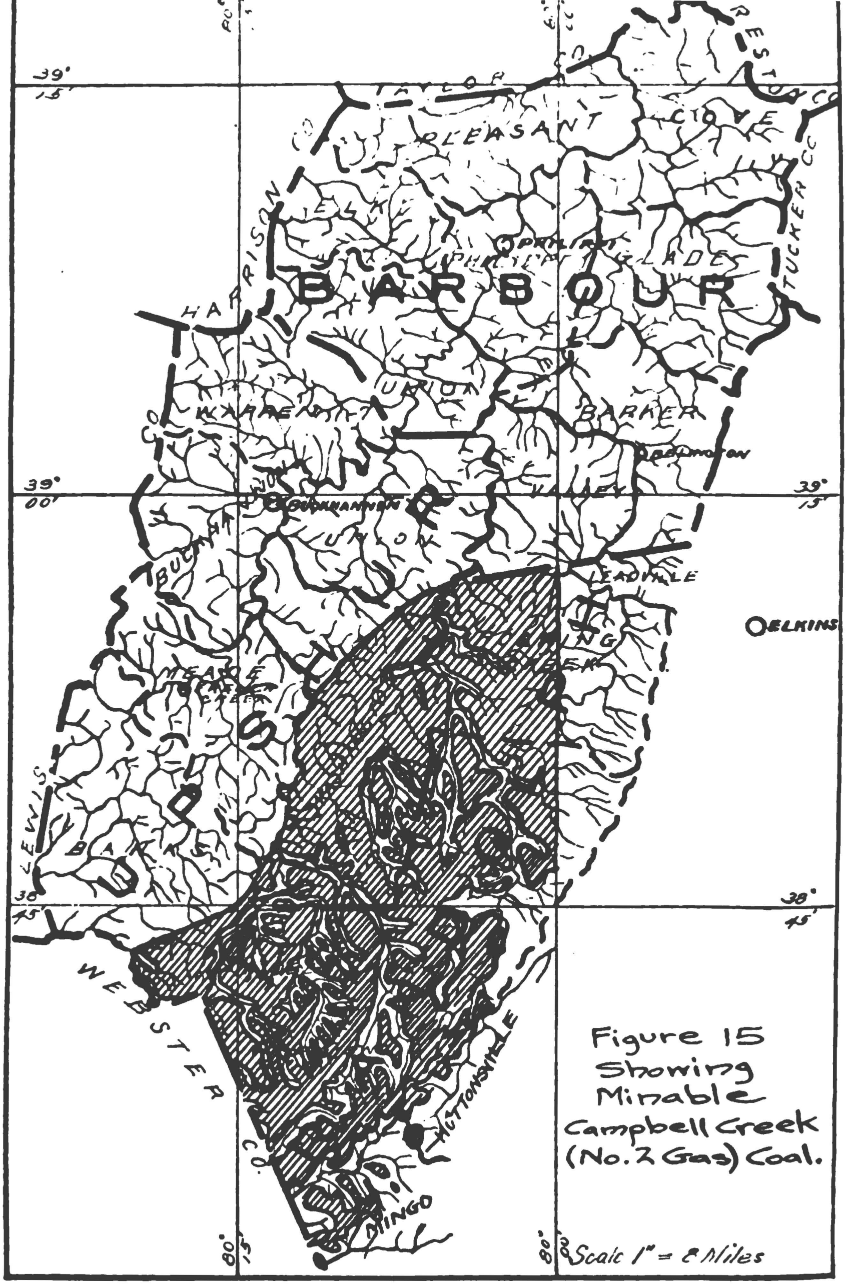

Figure 15
Showing
Minable
Campbell Creek
(No. 2 Gas) Coal.

Campbell Creek (No. 2 Gas) Coal, Barker District, Barbour.

The Campbell Creek Coal is exposed along the river in Barker District along the Hiram Anticline, as noted above, the following having been found:

Coal Exposure—No. 915 on Map II.

On the Tygart Valley River, 0.7 mile northwest of O'Brien; **Campbell Creek (No. 2 Gas) Coal**; elevation, 1515′ B.

	Ft.	In.
Sandstone, massive		
Slate, black, with Lingulae fossils	0	6
Coal	1	0
Fire clay shale, with iron ore, to grade	3	0

At **Coal Exposure No. 916 on Map II,** located on Tygart Valley River, 0.2 mile northwest of Clements, the coal is visible in the railroad cut at an elevation of 1571′ L., having a thickness of about 1 foot, as shown in detail in the section for Clements, page 110.

Campbell Creek (No. 2 Gas) Coal, Valley District, Barbour

No coal of minable thickness appears to be present at the Campbell Creek horizon in Valley District, but it appears to be represented by a thin seam in a few localities. The **George Booth Prospect (No. 917 on Map II),** located on Middle Fork River, 0.3 mile northeast of Lantz, at an elevation of 1845′ B., seems to be at this horizon. The place had fallen shut but apparently only a little coal was found. According to Teets, the coal was reported at **Exposure No. 918 on Map II,** along the Middle Fork River, 1.5 miles southeast of Swamp Run. Here it was said to have been seen at low water in the bed of the river, its thickness being 1′ 3″, and elevation, 1790′ B.

Campbell Creek (No. 2 Gas) Coal, Washington District, Upshur.

In Washington District, a coal has been mined for local use along the Middle Fork River in the vicinity of Ellamore, Gale, and Queen that appears to represent the Campbell Creek. At the first-named locality, Teets reports the following:

Moore-Keppel & Company Prospect—No. 919 on Map IV.

On Middle Fork River, 0:5 mile south of Ellamore; Campbell Creek (No. 2 Gas) Coal; elevation, 1840′ B.

	Ft.	In.
Sandstone, massive		
Coal	2	6
Slate		

A sample was collected from this opening, the composition of which is published under **Mine No. 919** in the table of coal analyses at the end of this Chapter.

The **Gilbert Osborn Farm Mine (No. 920 on Map IV),** located on Laurel Run of Right Fork of Middle Fork River, 0.9 mile east of Queen, had fallen shut when it was **visited** b Teets, but was reported 2 feet thick, its elevation being 2130′ B The four following openings, examined by Teets, show the structure of the coal in the immediate vicinity of Queen:

Gay Limbers Farm Mine—No. 921 on Map IV.

On Right Fork of Middle Fork River, 0.7 mile south of Queen; Campbell Creek (No. 2 Gas) Coal; elevation, 1955′ B.

			Ft.	In.
Slate				
Coal, soft	1′	3″		
Slate	0	6		
Coal, soft	1	4	3	1

Walker Lanham Farm Mine—No. 922 on Map IV.

On Right Fork of Middle Fork River, 0.8 mile south of Queen; Campbell Creek (No. 2 Gas) Coal; elevation, 1955' B.

			Ft.	In.
Slate				
Coal, soft	1'	3"		
Slate, dark	0	6		
Coal, soft	1	3	3	0
Slate, pavement				

The **Isaac Cutright Heirs Farm Mine (No. 923 on Map IV)**, located on Right Fork of Middle Fork, 1.1 miles south of Queen, had fallen shut at the time of Teets' visit and could not be measured, its elevation being 1990' B.

G. W. Zickefoose Farm Mine—No. 924 on Map IV.

On Right Fork of Middle Fork, 1.2 miles south of Queen; Campbell Creek (No. 2 Gas) Coal; elevation, 2010' B.

			Ft.	In.
Slate				
Coal, soft	1'	6"		
Slate	0	8		
Coal	1	0	3	2
Slate, pavement				

The following is one of the best openings noted in this locality:

Patrick Martin Farm Mine—No. 925 on Map IV.

On Jackson Fork of Middle Fork, 1.7 miles southeast of Queen; Campbell Creek (No. 2 Gas) Coal; elevation, 2150' B.

	Ft.	In.
Slate, dark		
Coal	3	5
Slate, pavement		

A sample was collected from this opening, the composition of which is published under **Mine No. 925** in the table of coal analyses at the end of this Chapter.

The **Robert Pomp Heirs Farm Mine (No. 926 on Map IV)**, located on Right Fork of Middle Fork River, 1 mile southeast of Hemlock, measured 2' 1" of clean coal, according to Teets, having an elevation of 2660' B.

A few openings were noted by Teets along the Left Fork of Buckhannon River on the Washington District side. The **Elkhorn Coal Corporation Farm Mine (No. 927 on Map IV)** located 1 mile east of Alexander, had an estimated thickness of 2′ 8″, at an elevation of 2150′ B. The coal had once been opened at **Prospect No. 928 on Map IV,** on Rough Run, 0.8 mile north of Shahan, at an elevation of 2405′ B., but had fallen shut and could not be measured.

Campbell Creek (No. 2 Gas) Coal, Banks District, Upshur.

In Banks District, the coal has been mined for local domestic use at several points in the region south of Alexander between the two forks of Buckhannon River, the following openings being noted by Teets:

L. P. Brooks Farm Mine—No. 929 on Map IV.

On a branch of Left Fork of Buckhannon River, 0.8 mile south of Alexander; Campbell Creek (No. 2 Gas) Coal; elevation, 2145′ B.

			Ft.	In.
Sandstone				
Coal	1′	9″		
Coal, bony	0	2		
Coal	0	7	2	6
Slate, pavement				

James Crawford Farm Mine—No. 930 on Map IV.

On Left Fork of Buckhannon River, 1.4 miles southeast of AlexAlexander; Campbell Creek (No. 2 Gas) Coal; elevation, 2145′ B.

			Ft.	In.
Sandstone, massive				
Slate, cannel			1	6
Coal	0′	10″		
Coal, bony	0	1		
Coal, soft	0	9		
Coal, bony	0	1		
Coal, soft	0	9	2	6
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 930** in the table of coal analyses at the end of this Chapter.

The **Henry Gladwell Farm Mine (No. 931 on Map IV),** located on Millsite Run, 1.1 miles northeast of Selbyville, measured 2′ 8″ of clean coal, at an elevation of 2228′ L. The **Ernest Stutzman Farm Mine (No. 932 on Map IV),** located on Millsite Run, 1.8 miles northeast of Selbyville, showed 2′ 6″ of clean coal, its elevation being 2270′ B. The **Fred Goodle Farm Mine (No. 933 on Map IV),** located on Millsite Run, 2 miles northeast of Selbyville, measured 2′ 5″, clean coal, its elevation being 2300′ B. The coal was once opened at **Prospect No. 933A on Map IV,** located on Right Fork of Buckhannon River, just west of Newlon, where, as shown by the Newlon Section, page 155, it measured 1′ 8″ thick, with an elevation of 2095′ L. At another point up the same fork what appears to be the Campbell Creek Coal is visible at **Coal Exposure No. 934 on Map IV,** just opposite Craddock, its thickness being 1′ 0″, and elevation, 2065′ B.

Campbell Creek (No.2 Gas) Coal, Roaring Creek District, Randolph.

Several openings have been made in the Campbell Creek Coal in Roaring Creek District along the waters of Middle Fork River, and the coal has been used for local fuel with results that are entirely satisfactory. The **Moore-Keppel & Company Farm Mine (No. 935 on Map IV),** located on Middle Fork River at the south edge of Ellamore, is reported by Teets as measuring 2′ 4″ of clean coal, its elevation being 1840′ B.

A few openings have been made along Laurel Creek. The **Emmet Connor Farm Mine (No. 936 on Map IV),** located 1.5 miles southeast of Ellamore, measured 2′ 0″ of clean coal at an elevation of 1955′ B. The **Peter Stanton Farm Mine (No. 937 on Map IV),** located 2 miles southeast of Ellamore, showed 2′ 3″ of clean coal, at an elevation of 1990′ B. The coal was once opened at the **Rafferty Farm Mine (No. 938 on Map IV),** located 2.5 miles southeast of Ellamore, at an elevation of 2035′ B., but its thickness was not obtained. All of the openings along Laurel Creek are only a few feet above drainage, and the coal goes under a short distance east of the old Rafferty mine.

The coal is visible along Middle Fork River opposite Gale at the **Moore-Keppel & Company Railroad Exposure (No. 939 on Map IV)**, having a total thickness of 3′ 1″, and an elevation of 1870′ B., as shown in detail in the section for Gale, page 141. It was once opened at **Farm Mine No. 940 on Map IV**, on Left Fork of Middle Fork River, 0.4 mile southeast of Gale, at an elevation of 1955′ B., but the place had been abandoned and could not be measured.

William Hornbeck Farm Mine—No. 941 on Map IV.

On Left Fork of Middle Fork River, 0.8 mile southeast of Gale; Campbell Creek (No. 2 Gas) Coal; elevation, 1910′ B.

			Ft.	In.
Sandstone, massive, visible			5	0
Coal, soft	1′	0″		
Coal, bony	0	6		
Coal, soft	1	0	2	6
Slate, pavement				

The **William Tallman Farm Mine (No. 942 on Map IV)**, located on Left Fork of Middle Fork River, 1.1 miles southeast of Gale, at an elevation of 1970′ B., had fallen shut but the seam was reported by Mr. Tallman as having measured slightly more than 2′ 6″, clean coal. The two following openings are reported by Teets:

Thomas Rowan Farm Mine—No. 943 on Map IV.

On a branch of Left Fork of Middle Fork River, 1.5 miles southeast of Gale; Campbell Creek (No. 2 Gas) Coal; elevation, 1985′ B.

			Ft.	In.
Slate				
Coal, soft	1′	0″		
Coal, bony	0	2		
Coal, soft	1	4	2	6
Slate, pavement				

William Hornbeck Farm Mine—No. 944 on Map IV.

On Kettle Run, 2.2 miles southeast of Gale; **Campbell Creek (No. 2 Gas) Coal**; elevation, 2020' B.

			Ft.	In.
Slate				
Coal, soft	1'	1"		
Coal, bony	0	2		
Coal, soft	1	6	2	9

A sample was collected from this opening, the composition of which is published under **Mine No. 944** in the table of coal analyses at the end of this Chapter.

Campbell Creek (No. 2 Gas) Coal, Middle Fork District, Randolph.

In Middle Fork District, the Campbell Creek Coal has been opened extensively for local use, and furnishes a fine grade of fuel. Several of these openings are along the Middle Fork River. The **Koon Heirs Prospect (No. 945 on Map IV)**, located on Long Run, 1.3 miles northwest of Long, at an elevation of 2295' B., had fallen shut and its thickness was not learned. The five following openings are reported by Teets:

Johnson Lower Farm Mine—No. 946 on Map IV.

On Jenks Fork of Right Fork of Middle Fork River, 2.1 miles northeast of Hemlock; **Campbell Creek (No 2 Gas) Coal**; elevation, 2790' B.

			Ft.	In.
Shale, sandy, roof				
Coal, soft	1'	9"		
Coal, bony	0	6		
Coal, soft	1	0	3	3
Slate, pavement				

John Fincham Farm Mine—No. 947 on Map IV.

On Left Fork of Middle Fork River, 1.6 miles north of Adolph; **Campbell Creek (No. 2 Gas) Coal**; elevation, 2453' L.

	Ft.	In.
Slate, gray, visible	8	0
Coal, soft, glossy, columnar	2	6
Slate, pavement		

A sample was collected from this opening, the composition of which is published under **Mine No. 947** in the table of coal analyses at the end of this Chapter.

Three very interesting chemical analyses of this coal, one of which includes a coke analysis, have been made by private parties, and have been furnished the Survey by Claude W. Maxwell, of Elkins, West Virginia, as follows:

Bethlehem Steel Co. Analysis of John Fincham (No. 2 Gas) Coal; Laurel Branch, 150 feet from river; coal 36 inches thick.

	Per cent.
Volatile Matter	33.25
Fixed Carbon	64.16
Ash	2.59
Total	100.00
Sulphur	1.08

W. Va. Coal & Coke Co. analysis of same:

	Per cent.
Volatile Matter	33.25
Fixed Carbon	64.00
Ash	2.70
Total	99.95
Sulphur	0.90

Alan Wood Iron & Steel Co. analysis of car-load of same:

	Per cent.
Volatile Matter	30.83
Fixed Carbon	65.16
Ash	4.01
Total	100.00
Sulphur	1.29

Analysis of coke from this car:

	Per cent.
Volatile Matter	0.93
Fixed Carbon	92.30
Ash	6.77
Total	100.00
Sulphur	0.88

The **N. C. Bell Heirs Farm Mine (No. 948 on Map IV),** located on Laurel Branch of Right Fork of Middle Fork, 1.6 miles northeast of Adolph, measured 2′ 7″ of clean, soft columnar coal, at an elevation of 2475′ B.

Mr. Claude W. Maxwell, of Elkins, West Virginia, has also furnished the Survey the following interesting analysis of coal from the Bell mine on Laurel Branch as made by the H. Koppers Company, Pittsburgh, Pa.:

	Per cent.
Volatile Matter	29.12
Fixed Carbon	68.57
Ash	2.31
Total	100.00
Sulphur	0.93
Phosphorus	0.005
Cubic feet of gas per net ton at 15° C.	11,554

Farm Mine No. 949 on Map IV, located on the same branch, 1.9 miles northeast of Adolph, showed 2′ 4″ of clean coal, at an elevation of 2560′ B.

The **Ephraim McCauley Farm Mine (No. 950 on Map IV),** located on the same branch, 2.5 miles northeast of Adolph, measured 1′ 10″ of clean coal, its elevation being 2615′ B.

The following opening is farther west on the opposite side of the Belington Syncline:

Ella Brake Farm Mine—No. 951 on Map IV.

On Birch Fork of Right Fork of Middle Fork, 0.9 mile northeast of Blue Rock; Campbell Creek (No. 2 Gas) Coal; elevation, 2885′ B.

				Ft.	In.
1.	Slate, black			2	0
2.	Coal	1′	0″		
3.	Shale, dark	4	0		
4.	Coal, hard	0	5		
5.	Coal, soft, columnar	2	2	7	7
6.	Slate, pavement				

A sample was collected from No. 5 of section, the composition of which is published under **Mine No. 951** in the table of coal analyses at the end of this Chapter.

An attempt was made to open what appears to represent the Campbell Creek Coal at the **Nicholas Loudin Prospect (No. 952 on Map IV),** on Birch Fork, 0.3 mile south of Blue Rock, at an elevation of 2975′ B., but here the thickness was reported as only 6 to 8 inches, the full height of the seam not being opened up.

Several openings have been made on the headwaters of Buckhannon River. The **J. J. Wuerzer Farm Mine (No. 953 on Map IV),** located on Trout Run, 1.3 miles northeast of

Helvetia, at an elevation of 2760′ B., had fallen shut at the time of Teets' visit and could not be measured. The two following openings were examined by Teets in the same region:

M. N. Hicks Farm Mine—No. 954 on Map IV.

On Saltblock Run, 0.8 mile northwest of Hartridge; **Campbell Creek (No. 2 Gas) Coal**; elevation, 3295′ B.

			Ft.	In.
Slate				
Coal, soft	1′	11″		
Coal, softer	0	9	2	8

Frank Hoover Farm Mine—No. 955 on Map IV.

On Middle Fork of Left Fork of Buckhannon, 1.1 miles west of Helvetia; **Campbell Creek (No. 2 Gas) Coal**; elevation, 2455′ B.

			Ft.	In.
Slate				
Coal, soft	1′	2″		
Coal, bony	0	10		
Coal, soft	1	3	3	3

The **R. T. McCauley Farm Mine (No. 956 on Map IV)**, located on Right Fork of Buckhannon River, 0.4 mile northwest of Silica, measured 2′ 2″ of splinty coal, with an elevation of 2490′ B.

Dr. J. L. Cunningham Prospect—No. 957 on Map IV.

On Marsh Fork, 0.7 mile southeast of Silica; **Campbell Creek (No. 2 Gas) Coal**; elevation, 2545′ B.

			Ft.	In.
Shale, sandy, dark				
Coal	0′	7″		
Slate, dark	0	8		
Coal, splinty	1	5	2	8
Slate, pavement				

Dr. J. L. Cunningham Prospect—No. 958 on Map IV.

On Marsh Fork, 0.8 mile southwest of Silica; **Campbell Creek (No. 2 Gas) Coal**; elevation, 2550′ B.

			Ft.	In.
Slate, dark			5	0
Coal	0′	6″		
Slate, black	0	3		
Coal, splinty	1	5	2	2
Slate, pavement				

The **Daniel Hefner Farm Mine (No. 959 on Map IV),** located on Marsh Fork, 1.5 miles northwest of Pickens, at an elevation of 2690′ B., had fallen partly shut, only 1 foot of coal being visible. The following opening is reported by Teets at the head of the same fork:

Peter Swint Farm Mine—No. 960 on Map IV.

On Marsh Fork, 1.2 miles southwest of Pickens; **Campbell Creek (No. 2 Gas) Coal**; elevation, 2850′ B.

			Ft.	In.
Coal, medium-hard	1′	7″		
Coal, harder, bony	1	0	2	7
Slate				

This opening had fallen shut, the above section having been measured at the mouth of the mine.

The **Mack Stadler Prospect (No. 961 on Map IV),** located on the head of Fall Run of Holly River, near the Webster County Line, 1.8 miles southwest of Pickens, had fallen partly shut, but showed 1 foot of coal, its elevation being 2755′ B. The **James Pickens Prospect (No. 962 on Map IV),** located on Right Fork of Buckhannon, 0.3 mile southeast of Pickens, in the elevation of 2890′ B., measured 2′ 8″, as shown in detail in the stratigraphic discussion of the coal, page 278. A sample was collected from this opening, the composition of which is published under **Mine No. 962** in the table of coal analyses at the end of this Chapter. The two following openings were noted by Teets farther up the same fork:

M. B. Stadler Farm Mine—No. 963 on Map IV.

On Right Fork of Buckhannon, 0.8 mile south of Pickens; **Campbell Creek (No. 2 Gas) Coal**; elevation, 2860′ B.

			Ft.	In.
Slate				
Coal, soft	1′	7″		
Coal, bony	1	3	2	10
Slate, pavement				

Marshall Arbogast Farm Mine—No. 964 on Map IV.

On Right Fork of Buckhannon, 1 mile south of Pickens; **Campbell Creek (No. 2 Gas) Coal**; elevation, 2915′ B.

			Ft.	In.
Slate				
Coal, soft	1′	8″		
Coal, bony	1	3	2	11
Slate, pavement				

The coal is reported by Teets at two points on Little Sugar Creek, tributary to the Elk River drainage system. The **Bird Casto Farm Mine (No. 965 on Map IV)**, located 2.5 miles southwest of Pickens, measured 2′ 0″ of clean coal at an elevation of 3060′ B.

L. M. Hull Farm Mine—No. 966 on Map IV.

On Little Sugar Creek, 3 miles southwest of Pickens; **Campbell Creek (No. 2 Gas) Coal**; elevation, 3050′ B.

			Ft.	In.
Slate, black, visible			4	0
Coal, soft	2′	1″		
Coal, bony	0	6	2	7
Slate, pavement				

The four following openings are reported by Teets on Left Fork of Buckhannon River:

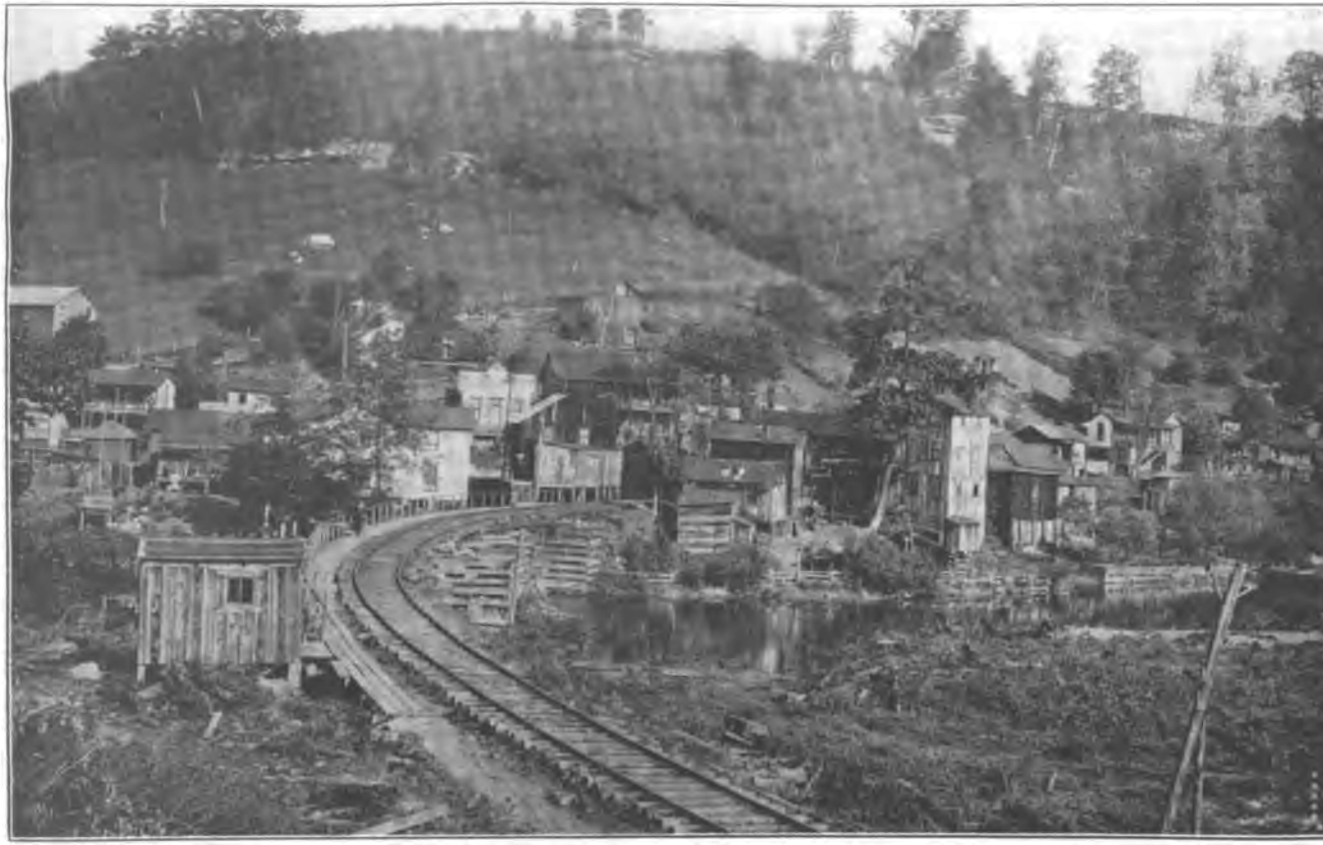

PLATE XL.—View looking northwest from Alexander, Upshur County, showing Pottsville topography with Homewo
Sandstone at top of hill; Buckhannon River in foreground.

Daniel Tenney Farm Mine—No. 967 on Map IV.

On Left of Buckhannon River, 0.7 mile southwest of Hartridge; Campbell Creek (No. 2 Gas) Coal; elevation, 3325′ B.

		Ft.	In.
Slate			
Coal, soft	1′ 10″		
Coal, harder	0 9	2	7
Slate, pavement			

The **M. N. Hicks Farm Mine (No. 968 on Map IV),** located on Left Fork of Buckhannon, 0.9 mile southwest of Hartridge, measured 2′ 7″ of clean coal, its elevation being 3325′ B. The **Gottfried Busky Farm Mine (No. 969 on Map IV),** located on Left Fork of Buckhannon, 2 miles southeast of Pickens, at an elevation of 3325′ B., had fallen shut and its thickness was not learned. The **J. W. Hartman Heirs Farm Mine (No. 970 on Map IV),** located on Left Fork of Buckhannon, 1.4 miles west of the Parting Springs, at an elevation of 3440′ B., had fallen shut, but the coal was reported 2′ 3″ thick.

Several openings have been made along the high mountain ridge that divides the Buckhannon River drainage from that of Sugar Creek and Back Fork of Elk, the coal being of exceptional purity. The **J. W. Hartman Heirs Farm Mine (No. 971 on Map IV),** located on the Sugar Creek side, 1.5 miles west of the Parting Springs, measured 3′ 0″ of clean, medium-hard coal, its elevation being 3415′ B.

Casper Winkler Farm Mine—No. 972 on Map IV.

On Sugar Creek, 1 mile west of the Parting Springs; Campbell Creek (No. 2 Gas) Coal; elevation, 3510′ B.

	Ft.	In.
Slate, dark		
Coal, medium-hard	2	11
Slate, pavement		

A sample was collected from this opening, the composition of which is published under **Mine No. 972** in the table of coal analyses at the end of this Chapter.

The **Louis Wuchner Farm Mine (No. 973 on Map IV),** located on the Sugar Creek side, 0.8 mile southeast of the

Parting Springs, at an elevation of 3550′ B., had fallen shut, but was reported 3′ 0″ thick. The **S. B. Elkins Heirs Farm Mine (No. 974 on Map IV)**, located on Left Fork of Buckhannon, 0.5 mile northwest of the Parting Springs, was reported by Teets to have measured 2′ 11″ of columnar coal, its elevation being 3535′ B.

Ida Smiley Farm Mine—No. 975 on Map IV.

On Long Run of Buckhannon River, 0.3, mile northeast of the Parting Springs; Campbell Creek (No. 2 Gas) Coal; elevation, 3675′ B.

			Ft.	In.
Slate, dark				
Coal, splint	0′	5″		
Coal, medium-hard	2	10	3	3
Slate, pavement				

Edward L. Eggleston Farm Mine—No. 976 on Map IV.

On Morgan Camp Run of Buckhannon, 0.8 mile northeast of the Parting Springs; Campbell Creek (No. 2 Gas) Coal; elevation, 3685′ B.

			Ft.	In.
Slate, dark				
Coal, splinty	0′	5 ″		
Coal, medium-hard	2	8½		
Slate, dark	0	0½		
Coal	0	5	3	7
Slate, pavement				

Quantity of Campbell Creek (No. 2 Gas) Coal Available.

In addition to the coal openings described on the previous pages, the accompanying table shows a list of oil and gas wells that record coal at what appears to be the Campbell Creek horizon in regions where it belongs under drainage. Another table is added showing the probable amount of this coal by magisterial districts, the areal extent of which was measured with planimeter by Tucker according to the surface and underground areas outlined for it on Map IV and Figure 15.

List of Oil and Gas Wells Recording Campbell Creek (No. 2 Gas) Coal.

No. on Map.	Name of Well.	Location.	Elevation of well mouth. A. T.	Depth to Coal. Feet.	Thickness. Feet.
	Barbour County:				
9	Julia Hall No. 1........	Elk City, 1.5 mi. N. W..	1048L	670	2
	Upshur County:				
83	Sherman Heirs No. 2....	Craddock, 0.7 mi. N. W.	2355B	242	3

Probable Amount of Campbell Creek (No. 2 Gas) Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Upshur:					
Union	2	2.75	1,760	153,331,200	6,133,248
Washington	2	44.95	28,768	2,506,268,160	100,250,726
Banks	2	12.85	8,224	716,474,880	28,658,995
Totals		60.55	38,752	3,376,074,240	135,042,969
Randolph:					
Roaring Creek...	2	32.30	20,672	1,800,944,640	72,037,786
Middle Fork.....	2½	73.50	47,040	5,122,656,000	204,906,240
Huttonsville	2½	2.70	1,728	188,179,200	7,527,168
Mingo	2½	3.65	2,336	254,390,400	10,175,616
Totals		112.15	71,776	7,366,170,240	294,646,810
Totals for Area..............		172.70	110,528	10,742,244,480	429,689,779

EAGLE COAL.

The Eagle Coal, previously discussed in Chapter VIII, page 282, and shown by outcrop on Map IV in those regions where it is of possible minable value, is of no commercial importance in the three counties except in Middle Fork District, Randolph, where it has been opened locally at several points, and where it shows a variable thickness of 2 to 4 feet. Figure 16 shows its probable areal extent as a minable seam.

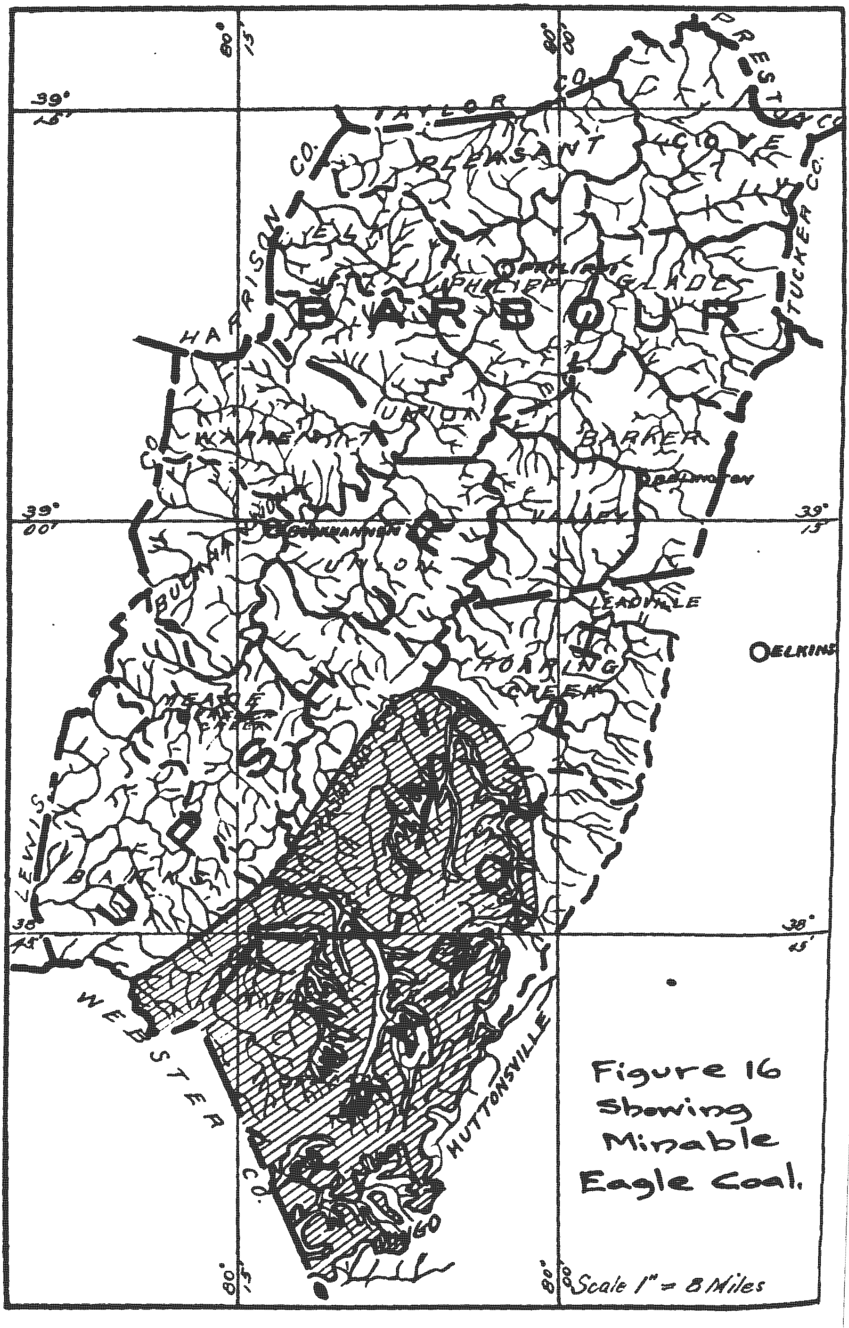

Figure 16
Showing
Minable
Eagle Coal.

Eagle Coal, Philippi District, Barbour.

In Barbour County, a coal 1′ 6″ thick was noted along the Tygart Valley River, just north of Adma, at **Coal Exposure No. 987 on Map II,** having an elevation of 1465′ B., and being 30 feet above the river, that seems to be near the Eagle horizon and probably represents it. It was not noted elsewhere in the county.

Eagle Coal, Banks District, Upshur.

In Banks District, the **Ernest Stutzman Farm Mine (No. 988 on Map IV),** noted by Teets on Millsite Run of Right Fork of Buckhannon River, 2 miles northeast of Selbyville, appears to represent the Eagle Coal. The mine had fallen shut, but was reported 2′ 4″ thick, its elevation being 2180′ B.

Eagle Coal, Roaring Creek District, Randolph.

In Roaring Creek District, what appears to be the Eagle horizon was once opened at **Coal Prospect No. 989 on Map IV,** on Left Fork of Middle Fork River, 0.7 mile south of Gale. The old digging had fallen shut and its thickness was not learned, the elevation being 1850′ B., and its interval below the Campbell Creek (No. 2 Gas) Coal, 60 feet.

Eagle Coal, Middle Fork District, Randolph.

The Eagle Coal has been opened at a few points along Middle Fork River in Middle Fork District, showing in some cases a fair thickness of low sulphur coal. The following prospects were noted:

Lloyd Zickefoose Farm Mine—No. 990 on Map IV.

On Long Run of Middle Fork River, 0.2 mile east of Loda; **Eagle Coal**; elevation, 2630′ B.

	Ft.	In.
Slate, sandy		
Coal, medium-hard	2	11
Slate, pavement		

A sample was collected from this opening, the composition of which is published under **Mine No. 990** in the table of coal analyses at the end of this Chapter.

Stephen Womelsdorff Prospect—No. 990A on Map IV.

On Cassity Fork of Middle Fork River, 1 mile southeast of Cassity; **Eagle Coal**; elevation, 2185′ B.

				Ft.	In.
1.	Slate, black			4	0
2.	**Coal**, soft, columnar	1′	9″		
3.	Slate, black	0	3		
4.	**Coal**	1	0	3	0
5.	Slate, pavement				

A sample was collected from Nos. 2 and 4 of section, the composition of which is published under **Mine No. 990A** in the table of coal analyses at the end of this Chapter.

The **Frank Phares Prospect (No. 990B on Map IV)**, located on Left Fork of Middle Fork, 1 mile northwest of Cassity, measured 3′ 9″ as shown in detail in the section for Cassity, page 170, its elevation being 2400′ B.

The **Rosencrants Heirs Prospect (No. 991 on Map IV)**, located on Cassity Fork, 4.1 miles east of Cassity, at an elevation of 3040′ B., and apparently representing the Eagle Coal, had fallen shut, but the coal was reported 4′ 6″ thick by Walter Brady, a resident. An attempt was once made to open the coal at **Prospect No. 992 on Map IV**, on Left Fork of Middle Fork River, 1 mile north of Adolph, but the place had fallen shut and only a few lumps of coal were visible on the dump, its elevation being 2415′ B. The **Simeon Kittle Farm Mine (No. 992A on Map IV)**, located on Left Fork of Middle Fork River, 2.1 miles southeast of Adolph, measured a total thickness of 2′ 6″, with an elevation of 2675′ B., as exhibited in detail in the section for Big Laurel Thicket, page 176.

James Shannon Farm Mine—No. 993 on Map IV.

On Left Fork of Middle Fork River, 1.8 miles southeast of Adolph; **Eagle Coal**; elevation, 2805′ B.

				Ft.	In.
1.	Shale, dark			10	0
2.	**Coal**, bony	0′	6″		
3.	**Coal**, soft, columnar	1	7	2	1
4.	Slate, pavement				

A sample was collected from No. 3 of section, the composition of which is published under **Mine No. 993** in the table of coal analyses at the end of this Chapter.

Several openings have been made on the waters of Buckhannon River, the five following being reported by Teets:

Elkhorn Coal Corporation Prospect—No. 994 on Map IV.

On Lower Dry Run of Left Fork of Buckhannon River, 2.4 miles southeast of Palace Valley; **Eagle Coal**; elevation, 2815′ B.

			Ft.	In.
Slate, black, cannelly				
Coal	0′	4″		
Coal, bony	0	5		
Coal, soft	1	3		
Slate, gray	1	4		
Coal, soft	1	3	4	7
Slate, pavement				

The **G. W. Sanderson Farm Mine (No. 995 on Map IV)**, located on Left Fork of Right Fork of Buckhannon just west of Czar, had fallen shut and its thickness was not learned, the elevation being 2250′ B. The **John J. Zumbach Farm Mine (No. 996 on Map IV)**, located on the same fork just southeast of Czar, measured 1′ 3″ of soft coal, at an elevation of 2255′ B

J. J. Wuerzer Farm Mine—No. 997 on Map IV.

On Trout Run, 1 mile southeast of Czar; **Eagle Coal**; elevation, 2455′ B.

			Ft.	In.
Sandstone, visible			2	0
Slate, black			3	0
Coal, bony	0′	4″		
Coal, soft	2	2	2	6
Slate, pavement				

George Smith Farm Mine—No. 998 on Map IV.

On Trout Run, 1 mile southeast of Czar; **Eagle Coal**; elevation, 2450′ B.

			Ft.	In.
Sandstone, visible			5	0
Slate, black			3	0
Coal, bony	0′	4″		
Coal, soft	2	2	2	6
Slate, pavement				

The coal was once opened at **Prospect No. 999 on Map IV,** on Middle Fork of Buckhannon River, 0.6 mile south of Newlon, at an elevation of 2000′ B., but its thickness was not learned. It is also reported by Teets at the following locality:

William Kerign Farm Mine—No. 1000 on Map IV.

On Middle Fork of Buckhannon River, 2.3 miles southeast of Newlon; **Eagle Coal**; elevation, 2225′ B.

			Ft.	In.
Slate, black				
Coal	0′	4″		
Slate, gray	0	9		
Coal, good	1	1	2	2
Slate, pavement				

On Right Fork of Buckhannon River, the **John McCauley Bore Hole (131)**, located just west of Silica, was made to test the Eagle Coal, and according to Mr. McCauley, it was found at a depth of 12 feet, and with a thickness of 4 feet. The coal comes to the surface 0.2 mile southeast of Silica at the old sand plant, where, at **Prospect No. 1001 on Map IV,** it is reported to have been stripped from the river bed at low water, its elevation being 2360′ B. The following opening shows what is probably the maximum development of the Eagle seam in western Randolph:

John Gimmel Farm Mine—No. 1002 on Map IV.

On Right Fork of Buckhannon River, 0.7 mile south of Silica; **Eagle Coal**; elevation, 2440′ B.

			Ft.	In.
Slate				
Coal, bony	0′	6″		
Coal, hard, splinty	2	2		
Coal	1	4	4	0
Slate, pavement				

A sample was collected from this opening by Teets, the composition of which is published under **Mine No. 1002** in the table of coal analyses at the end of this Chapter.

The **Holly Lumber Company Water Well (132)**, drilled at Pickens, encountered a 4-foot seam of coal at a depth of 56 feet, according to Dr. J. L. Cunningham, that would represent the Eagle. It would seem that further prospecting and drilling in this locality might disclose a considerable area of minable coal at this horizon.

Quantity of Eagle Coal Available.

In addition to the coal openings described on the previous pages, the accompanying table gives a list of oil and gas wells that record coal at what appears to be the Eagle horizon in regions where it is under drainage. Another table is added showing the probable amount of this coal by magisterial districts, the areal extent of which was measured with planimeter by Tucker according to the surface and underground areas outlined for it on Map IV and Figure 16.

List of Oil and Gas Wells Recording Eagle Coal.

No. on Map.	Name of Well.	Location.	Elevation of well mouth. A. T.	Depth to Coal. Feet.	Thickness. Feet.
	Barbour County:				
9	Julia Hall No. 1........	Elk City, 1.5 mi. N. W..	1048L	760	3
	Upshur County:				
59A	Isherwood & Cody No. 1..	Stockerts	2117B	145	2
84	Silica Sand Co. No. 3...	Craddock, 0.3 mi. N. W.	2505B	590	3
89	Sherman Heirs No. 1....	Craddock, 0.5 mi. N. E..	2025B	80	6

Probable Amount of Eagle Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Upshur:					
Washington	2	33.50	21,440	1,867,852,800	74,714,112
Banks	2	22.00	14,080	1,226,649,600	49,065,984
Totals		55.50	35,520	3,094,502,400	123,780,096
Randolph:					
Roaring Creek..	2	6.90	4,416	384,721,920	15,388,877
Middle Fork.....	2	102.90	65,856	5,737,374,720	229,494,989
Huttonsville	2	5.55	3,552	309,450,240	12,378,009
Mingo	2	7.25	4,640	404,236,800	16,169,472
Totals		122.60	78,464	6,835,783,680	273,431,347
Totals for Area...............		178.10	113,984	9,930,286,080	397,211,443

GILBERT COAL.

The Gilbert Coal, previously discussed in Chapter VIII, pages 283-284, was noted only in portions of Middle Fork District, Randolph, where it is a thin seam, varying from 1 to 3 feet. Some of the prospects show a good grade of soft coal, that may become of value when the thicker seams have all been appropriated. Figure 17 shows its possible minable extent.

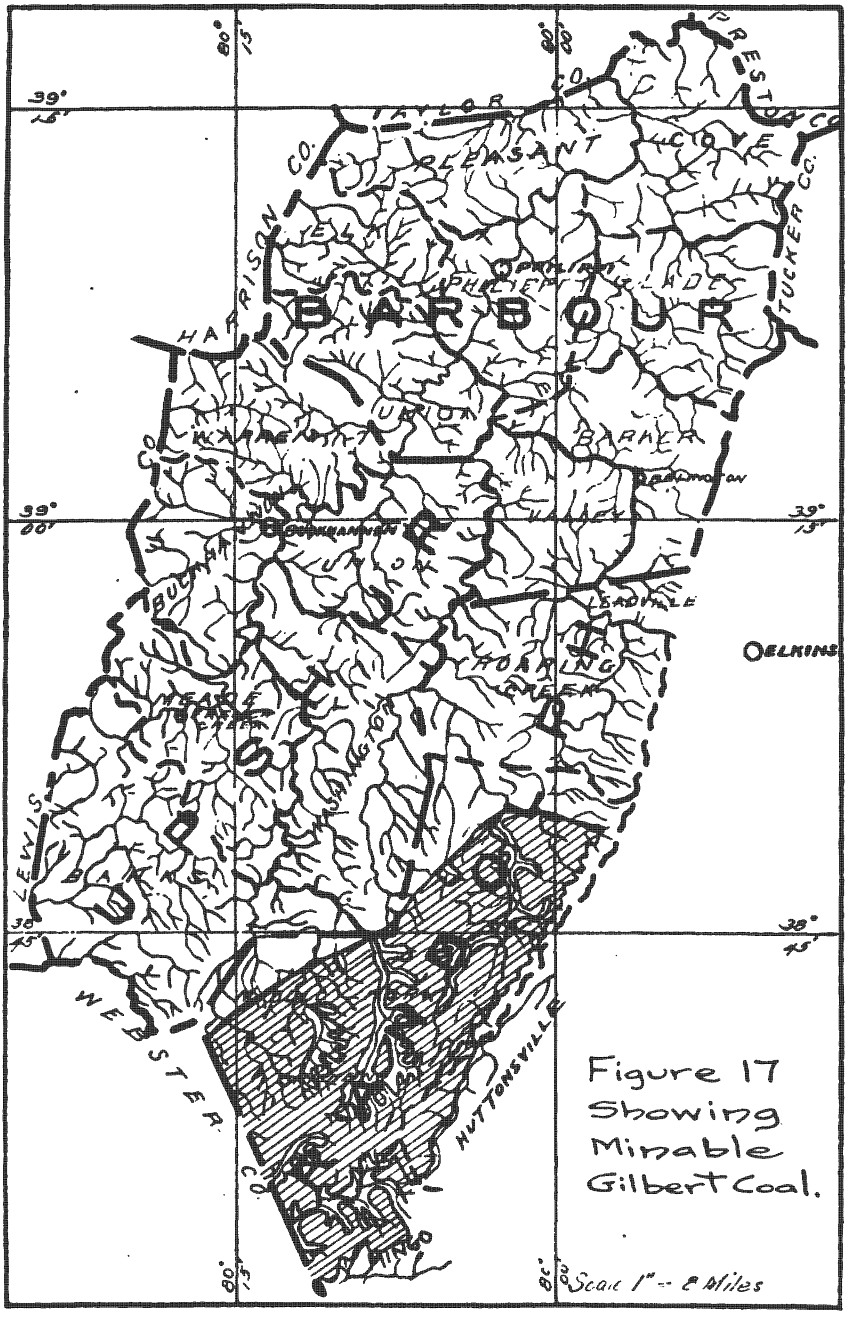

Figure 17
Showing
Minable
Gilbert Coal.

Gilbert Coal, Middle Fork District, Randolph.

Most of the prospects found in the Gilbert Coal were along the Left Fork of Middle Fork River. **Coal Prospect No. 1003 on Map IV,** located on this stream, 2.4 miles north of Long, measured 1′ 11″ of clean coal, according to Teets, with an elevation of 2125′ B. At **Prospect No. 1004 on Map IV,** located on Middle Fork River, 0.4 mile west of Cassity, 1 foot of coal was visible, at an elevation of 2263′ L. At the **Robert Fox Farm Mine (No. 1005 on Map IV),** located on Middle Fork River, 1.6 miles south of Cassity, 1 foot of coal was visible, but the opening had fallen partly shut, the total thickness being reported 2 feet, and the elevation being 2215′ B.

The **Robert Fox Prospect (No. 1006 on Map IV),** located on Middle Fork River, 1.7 miles south of Cassity, had fallen shut and its thickness was not learned, the elevation being 2220′ B.

The coal was once opened at **Prospect No. 1007 on Map IV,** on Stonecoal Run, 2.5 miles south of Cassity, at an elevation of 2175′ B., but the place had fallen shut and could not be measured. At the **Charles Fincham Farm Mine (No. 1008 on Map IV),** located on Laurel Run of Middle Fork River, 2 miles north of Adolph, there was 1′ 1″ of coal visible, the entire seam being reported 2′ 0″ thick, its elevation being 2260′ B. The **Moore-Keppel & Company Prospect (No. 1009 on Map IV),** located on Schoolcraft Run, 1.3 miles northwest of Adolph, measured 1′ 6″ of clean coal, at an elevation of 2395′ B. **Farm Mine No. 1010 on Map IV,** located on a branch of Schoolcraft Run, 1.6 miles north of Blue Rock, measured 2′ 4″ of clean coal, at an elevation of 2830′ B., the opening being located well up toward the crest of the Hiram Anticline. **Prospect No. 1011 on Map IV,** located on Middle Fork River, 0.8 mile north of Adolph, at an elevation of 2295′ B., measured 1′ 4″ of coal.

Coal Prospect—No. 1012 on Map IV.

On Middle Fork River, 0.6 mile north of Adolph; **Gilbert Coal**; elevation, 2350′ B.

			Ft.	In.
Shale				
Coal	0′	2″		
Shale, gray	0	5		
Coal	0	6		
Shale, gray	0	8		
Coal	0	8	2	5
Slate, pavement				

Christian Goss Farm Mine—No. 1013 on Map IV.

On Birch Fork of Middle Fork River, 0.5 mile southeast of Blue Rock; **Gilbert Coal**; elevation, 2875′ B.

			Ft.	In.
Sandstone, massive				
Shale, sandy, dark			3	0
Coal, soft	1′	3″		
Shale, gray	0	4		
Coal, soft	1	0	2	7

The **Christian Goss Prospect (No. 1014 on Map IV)**, located on Birch Fork of Middle Fork River, 0.6 mile southeast of Blue Rock, at an elevation of 2885′ B., measured 2′ 4″ of clean coal. Another bench of coal 2′ 6″ thick was reported several feet below the upper layer.

On the waters of Buckhannon River, the coal was noted at a few points by Teets. The **Steven Morgan Farm Mine (No. 1015 on Map IV)**, located on Left Fork, 0.2 mile south of Palace Valley, measured 2′ 3″ of clean coal, at an elevation of 2445′ B. The **F. F. Zumbach Prospect (No. 1016 on Map IV)**, located on Left Fork of Right Fork of Buckhannon, at Helvetia, had fallen shut and could not be measured, its elevation being 2275′ B.

Quantity of Gilbert Coal Available.

The following table shows the probable amount of Gilbert Coal by magisterial districts, the areal extent of which was measured with planimeter by Tucker according to the surface and underground areas outlined for it on Map IV and Figure

17. No prospects were observed in the southern end of Middle Fork District and the northern end of Mingo, but the coals should thicken generally in that direction, the fact that this area is almost entirely wooded accounting for the lack of openings:

Probable Amount of Gilbert Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Randolph:					
Middle Fork......	2	106.30	68,032	5,926,947,840	237,077,914
Huttonsville	2	7.90	5,056	440,478,720	17,619,149
Mingo	2	9.95	6,368	554,780,160	22,191,206
Totals		124.15	79,456	6,922,206,720	276,888,269

MINABLE COALS OF THE POTTSVILLE SERIES, NEW RIVER GROUP.

HUGHES FERRY COAL.

The Hughes Ferry Coal, previously discussed in Chapter VIII, page 285, was observed principally in Middle Fork District, Randolph, where it is a good soft coal of the typical New River columnar type, being sometimes 2 feet thick. Figure 18 shows its possible minable extent.

Hughes Ferry Coal, Banks District, Upshur.

In Banks District, the Hughes Ferry Coal was noted by Teets at the **James Morgan Farm Mine (No. 1017 on Map IV)**, on Bearcamp Run of Left Fork of Buckhannon River, 0.3 mile southwest of Shahan, where it measured 2′ 0″ of clean coal, its elevation being 2145′ B.

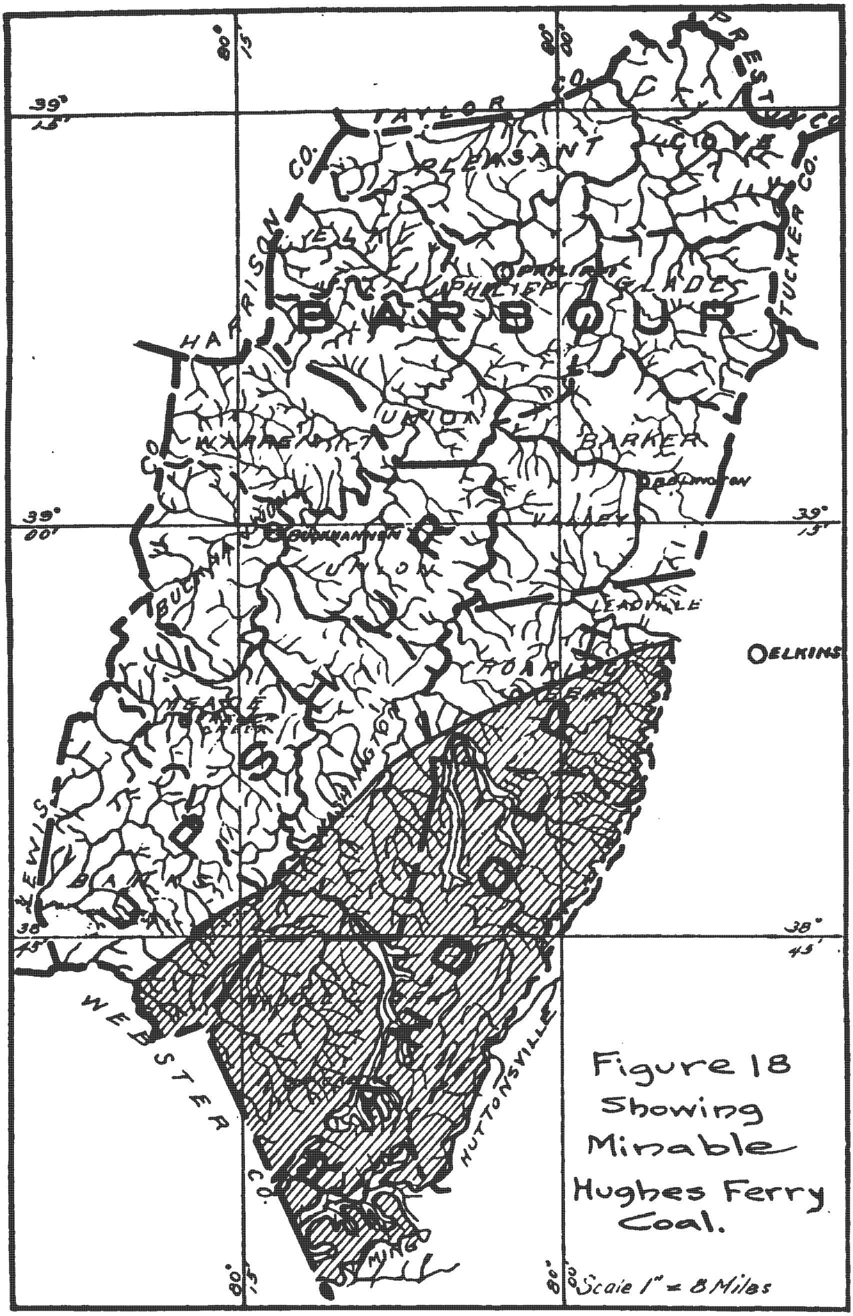

Figure 18
Showing
Minable
Hughes Ferry
Coal.

Hughes Ferry Coal, Roaring Creek District, Randolph.

The Hughes Ferry Coal was noted by Teets in Roaring Creek District on Left Fork of Middle Fork River, at **Prospect No. 1018 on Map IV,** located 2.3 miles north of Long, where it measured 2′ 0″ thick, with an elevation of 2110′ B.

Hughes Ferry Coal, Middle Fork District, Randolph.

In Middle Fork District, scattered prospects were observed in the coal, indicating its probable general occurrence throughout a considerable part of this region. On Jenks Fork of Right Fork of Middle Fork River, it was noted by Teets at the **Dora Poling Farm Mine (No. 1019 on Map IV)**, 1.2 miles south of Cubana. This opening had fallen shut and the thickness was not learned, the elevation being 2475′ B. At **Exposure No. 1020 on Map IV,** located on Cassity Fork, 0.4 mile southeast of Cassity, the coal is visible in the public road, having a thickness of 1 foot and an elevation of 2040′ B. At **Prospect No. 1021 on Map IV,** located on Left Fork of Middle Fork River, 1.7 miles south of Cassity, the coal was reported 1 foot thick, with an elevation of 2160′ B. The coal is reported by Teets at a few points on the head of Laurel Branch of Middle Fork, where the rocks are rising rapidly toward the top of Rich Mountain. The **Arch Shifflett Farm Mine (No. 1022 on Map IV),** located 3 miles northeast of Adolph, at an elevation of 2675′ B., had fallen shut and could not be measured.

Joseph Currence Farm Mine—No. 1023 on Map IV.

On Laurel Branch of Middle Fork River, 3 miles northeast of Adolph; **Hughes Ferry Coal**; elevation, 2910′ B.

			Ft.	In.
Slate				
Coal, soft	2′	1″		
Shale	0	8		
Coal, harder	1	0	3	9
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 1023** in the table of coal analyses at the end of this Chapter.

The **Joseph Currence Farm Mine (No. 1024 on Map IV),** located about 3 miles northeast of Adolph, at an elevation of 2940′ B., had fallen shut and could not be measured.

The coal has been prospected on the waters of Buckhannon River at a few points, the following being noted on Left Fork:

Elkhorn Coal Corporation Prospect—No. 1025 on Map IV.

On Left Fork of Buckhannon River, at Hartridge; Hughes Ferry Coal; elevation, 2912′ B.

	Ft.	In.
Shale, dark, sandy	10	0
Coal, soft, columnar	2	0
Shale, hard, with plant fossils	3	0

A sample was collected from this opening by Teets, the composition of which is published under **Mine No. 1025** in the table of coal analyses at the end of this Chapter. This opening is 177 feet, by hand-level, above the Sewell Coal.

The **Emil Metzner Farm Mine (No. 1026 on Map IV),** located on Saltlick Run of Left Fork of Right Fork of Buckhannon, 2.5 miles southeast of Helvetia, measured 2′ 0″ of soft, columnar coal, according to Teets, with an elevation of 2655′ B.

On Back Fork of Elk River, the coal is visible at **Exposure No. 1027 on Map IV,** located along the Alexander and and Eastern Railroad grade, 1.2 miles southeast of the Parting Springs, with a thickness of 2 feet, and an elevation of 3335′ B., and at the **Holly Lumber Co. Prospect (No. 1027A on Map IV),** located on Zimmerly Run, 1.8 miles south of the Parting Springs, having a thickness of 1′ 11″ and an elevation of 3160′ B.

Quantity of Hughes Ferry Coal Available.

The fact that the Hughes Ferry Coal has been prospected but little makes its exact extent and thickness somewhat uncertain, but it has usually shown a thickness of about two feet at the scattered openings available and it is also known to be present in good thickness on Mill Run of Sugar Creek, in Webster County, immediately west of the Middle Fork District Line. It would therefore seem probable that further prospecting would reveal good coal at this horizon over a considerable portion of Middle Fork District, and some also in Roaring Creek and Banks Districts. The accompanying table gives a list of oil and gas wells that record coal at what appears to be the Hughes Ferry horizon in regions where it lies under drainage. Another table is added showing the probable amount of this coal by magisterial districts, the areal extent of which was measured with planimeter by Tucker on Map IV according to the surface and underground areas outlined for it on Figure 18.

List of Oil and Gas Wells Recording Hughes Ferry Coal.

No. on Map.	Location.	Name of Well.	Elevation of well mouth. A. T.	Depth to Coal. Feet.	Thickness. Feet.
	Upshur County:				
82	E. H. Peck No. 1.......	Canaan, 1 mi. E........	2230B	450	3
84	Silica Sand Co. No. 3....	Craddock, 0.3 mi. N. W.	2505B	650	6
87	Silica Sand Co. No. 4....	Craddock, 0.4 mi. E....	2505B	694	1
	Randolph County:				
90	Buckhannon Chemical Co. No. 1............	Newlon	1905L	130	1

Probable Amount of Hughes Ferry Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Upshur:					
Banks	2	23.60	15,104	1,315,860,480	52,634,419
Washington	2	27.75	17,760	1,547,251,200	61,890,048
Totals		51.35	32,864	2,863,111,680	114,524,467
Randolph:					
Roaring Creek	2	30.00	19,200	1,672,704,000	66,908,160
Middle Fork	2	145.00	92,800	8,084,736,000	323,389,440
Huttonsville	2	9.15	5,856	510,174,720	20,406,989
Mingo	2	11.50	7,360	641,203,200	25,648,128
Totals		195.65	125,216	10,908,817,920	436,352,717
Totals for Area		247.00	158,080	13,771,929,600	550,877,184

CASTLE COAL.

The Castle Coal, previously discussed in Chapter VIII, page 287, was observed in the southeastern edge of Washington District, Upshur, and at scattered localities in Middle Fork District, Randolph, its usual thickness being about 2 feet, and its character being much the same as the other New River coals. Figure 19 shows its possible minable extent.

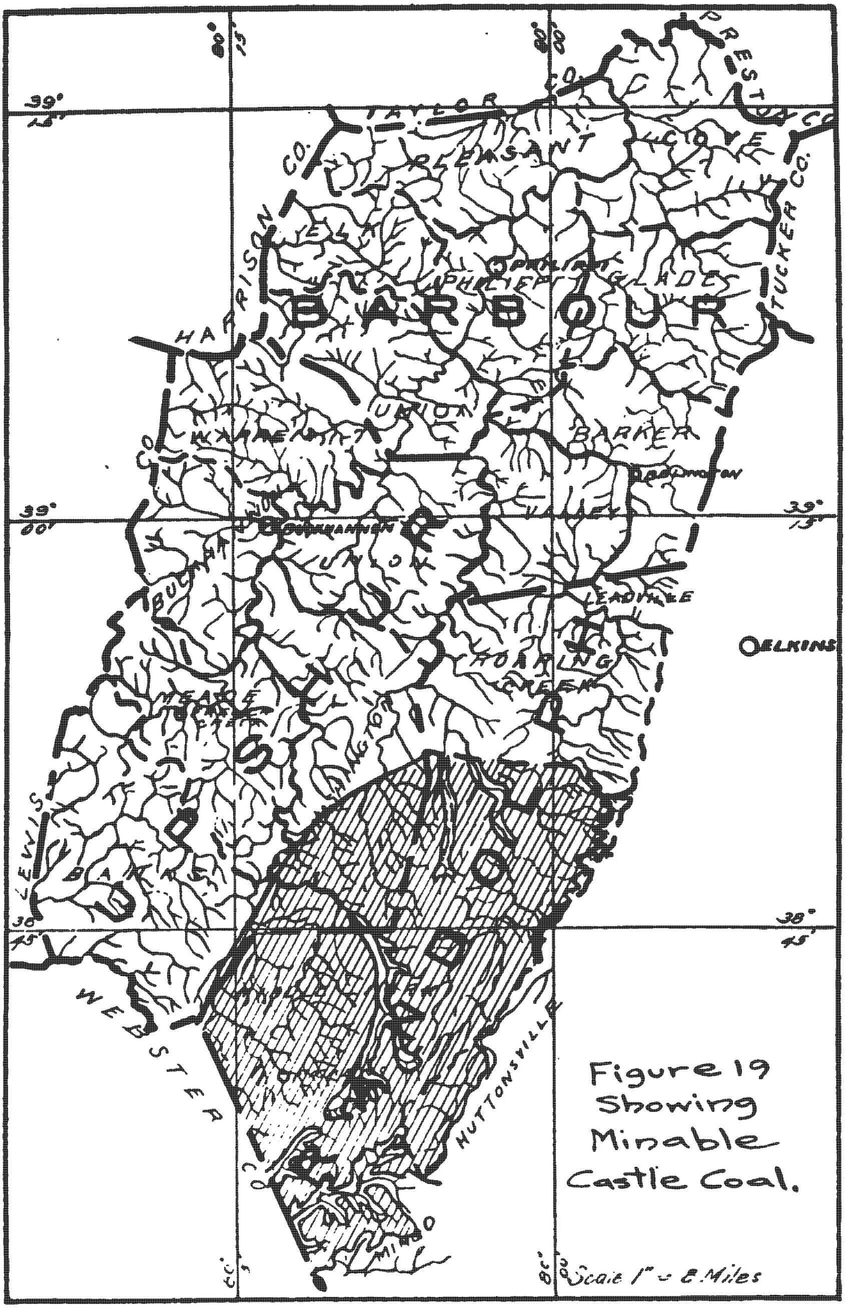

Figure 19
Showing
Minable
Castle Coal.

Castle Coal, Washington District, Upshur.

In Washington District, the Castle Coal was noted by Teets at several points along Jenks Fork of Middle Fork, as follows:

Clay Hinkle Farm Mine—No. 1028 on Map IV

On Jenks Fork of Middle Fork River, 1.8 miles west of Cubana; **Castle Coal**; elevation, 2120' B.

			Ft.	In.
Slate, cannel, with marine fossils			4	0
Coal	1'	3"		
Slate	0	3		
Coal	0	6	2	0
Slate, pavement				

Jefferson Hinkle Farm Mine—No. 1029 on Map IV.

On Jenks Fork, 2.2 miles northeast of Hemlock; **Castle Coal**; elevation, 2145' B.

	Ft.	In.
Slate, cannel, with marine fossils		
Coal	1	3
Slate, pavement		

The **A. B. Shipman Farm Mine (No. 1030 on Map IV)**, located on Jenks Fork, 1.5 miles northeast of Hemlock, at an elevation of 2240' B., had fallen shut and could not be measured.

Elliott Zickefoose Farm Mine—No. 1031 on Map IV.

On Jenks Fork, 1.3 miles northeast of Hemlock; **Castle Coal**; elevation, 2275' B.

			Ft.	In.
Slate				
Coal, soft	1'	9"		
Coal, bony	0	4		
Coal, soft	0	3	2	4

Castle Coal, Middle Fork District, Randolph.

In Middle Fork District, the Castle Coal was observed at various points, mainly on the Middle Fork River drainage basin. At **Prospect No. 1032 on Map IV,** located on Long Run, 0.3 mile west of Loda, the coal had been opened at an elevation of 2520′ B., but had fallen shut and could not be measured. At **Prospect No. 1033 on Map IV,** located on Middle Fork River just west of Cassity, the opening had fallen shut, being reported as slightly over 2 feet by Reuben Zirkle, and having an elevation of 2180′ B. The **A. J. Long Prospect (No. 1034 on Map IV),** located on Middle Fork River just southwest of Cassity, at an elevation of 2180′ L., had fallen partly shut, being reported 2 feet thick, 1 foot of which was visible.

The coal is reported by Teets at **Prospect No. 1035 on Map IV,** located on Left Fork of Right Fork of Buckhannon River, 1.6 miles northeast of Pickens, with a thickness of 1′ 3″ and an elevation of 2510′ B.

On the Back Fork of Elk River, the coal was noted at the **Holly Lumber Co. Prospect (No. 1035A on Map IV),** located on Zimmerly Run, 1.8 miles south of the Parting Springs, with a thickness of 1′ 11″ and an elevation of 3070′ B.

Castle Coal, Huttonsville District, Randolph.

The following exposure, located on the waters of Tygart Valley River, near the southern end of the Belington Syncline, probably represents the Castle Coal:

Coal Exposure—No. 1035B on Map IV.

On Mill Creek, 3.4 miles southeast of Beech Run; Castle Coal; elevation, 2820′ B.

			Ft.	In.
Coal	1′	6″		
Slate, black	0	4		
Coal, cannel bone	1	3	3	0
Fire clay shale in creek				

Besides the surface openings named above, the Castle Coal was found in several diamond drill borings on Middle Fork and Buckhannon Rivers, as may be noted in the table of abbreviated records for Randolph County, page 421, and as elsewhere published in detail. It was also found in the **Sherman Heirs No. 2 (83) gas well**, near Craddock, the depth to the coal being 545 feet and its thickness 3 feet.

Quantity of Castle Coal Available.

The following table shows the probable amount of Castle Coal available, as determined with planimeter by Tucker, according to the surface and underground areas outlined for it on Map IV and Figure 19. These figures can not be regarded as final owing to the lack of prospects in some portions of the region outlined:

Probable Amount of Castle Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Upshur:					
Washington	2	26.00	16,640	1,449,676,800	57,987,072
Banks	2	9.00	5,760	501,811,200	20,072,448
Totals		35.00	22,400	1,951,488,000	78,059,520
Randolph:					
Middle Fork.....	2	150.00	96,000	8,363,520,000	334,540,800
Huttonsville	2	10.35	6,624	577,082,880	23,083,315
Mingo	2	13.00	8,320	724,838,400	28,993,536
Totals		173.35	110,944	9,665,441,280	386,617,651
Totals for Area...............		208.35	133,344	11,616,929,280	464,677,171

SEWELL COAL.

The Sewell Coal, previously discussed in Chapter VIII, pages 290-291, and shown by outcrop on Map IV in those regions where it is of minable thickness, is of value principally in those Districts of Randolph County embraced in this Report, Middle Fork having a much greater area of good coal at this horizon than the other Districts. The thickness of this coal varies from 2 to 5 feet, the seam being usually free from slate partings except for a characteristic streak of bony coal at the base. This coal is of uniformly good quality, having the typical soft, columnar appearance of the New River coal. It has been mined commercially at two or three points in Randolph, but these mines are not now in operation. Figure 20 shows its probable minable extent.

Sewell Coal, Glade District, Barbour.

In Glade District, the horizon of the Sewell, or Sharon, Coal is exposed along the crest of the Laurel Ridge, but, so far as known, has seldom been prospected and probably contains little minable coal in this region. The following opening seems to represent it, having the typical bony coal in the bottom:

Stewart L. Johnson Farm Mine—No. 1038 on Map II.

On Laurel Ridge, at the head of a branch of Teter Creek, 2.4 miles northeast of Kirt; Sewell Coal; elevation, 2745′ B.

		Ft.	In.
Shale, sandy		7	0
Coal, soft, good	1′ 0″		
Coal, bony	1 0	2	0
Slate, pavement			

Sewell Coal, Leadsville District, Randolph.

In Leadsville District, the Sewell Coal was noted along the Tygart Valley River gorge where this river cuts through the Laurel Ridge. The **Elkins Electric Railway Company Prospect (No. 1039 on Map IV)**, located 1.9 miles east of

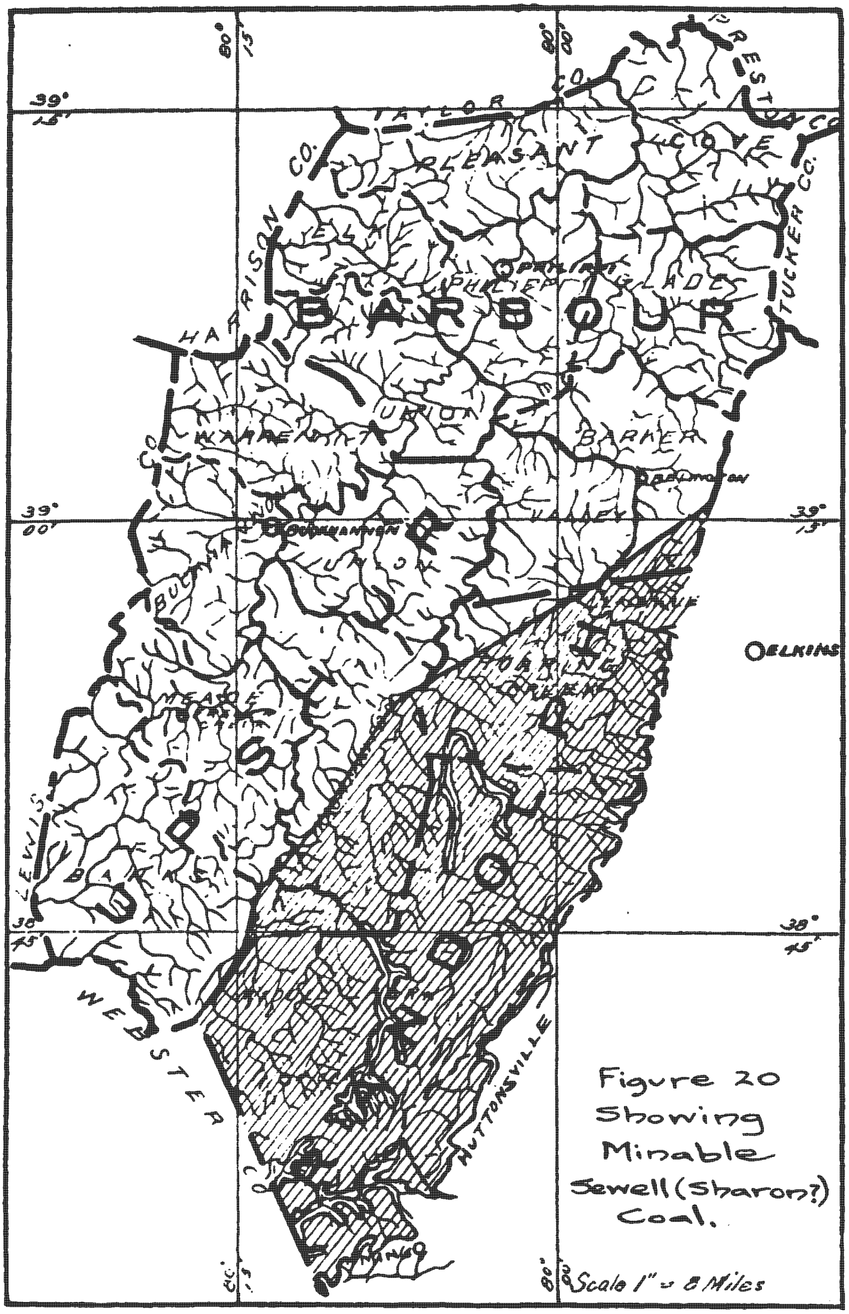

Figure 20
Showing
Minable
Sewell (Sharon?)
Coal.

Roaring Creek Junction, measured 2′ 8″ of clean, soft coal, with an elevation of 2093′ B. The southern end of Laurel Ridge might contain a considerable body of this coal, the mining of which would be somewhat difficult, owing to the steep structural slope.

Sewell Coal, Roaring Creek District, Randolph.

In Roaring Creek District, the Sewell Coal has been opened in two localities, one of these being along the western slope of Rich Mountain, east of Roaring Creek, and the other along the waters of Middle Fork River, where the Hiram Anticline brings the New River Group above drainage. In both of these regions, the coal is of good thickness and quality, having the typical New River appearance and composition.

On the Tygart Valley River, the coal was once opened at the **Claude W. Maxwell Farm Mine (No. 1040 on Map IV),** located 1.7 miles southeast of Roaring Creek Junction, at an elevation of 2090′ B. According to Teets, the opening had fallen shut and its thickness was not learned. The **Martin Roy Farm Mine (No. 1041 on Map IV),** located on Rich Mountain just east of the crest and 2.5 miles southeast of Roaring Creek Junction, and probably in the edge of Beverly District, had fallen shut at the time it was visited by Teets, the coal being reported as slightly less than 3 feet, its elevation being 2615′ B. The **Claude W. Maxwell Farm Mine (No. 1042 on Map IV),** located on the west side of the crest of the mountain on Roaring Creek waters, had fallen shut at the time of Teets' visit and could not be measured, its elevation being 2660′ B.

At the low gap where the Parkersburg and Staunton Turnpike crosses Rich Mountain, the coal has been mined for many years, a large amount having been hauled eastward to the Tygart Valley in the years before railroad transportation was available there. **Prospect No. 1043 on Map IV,** located on the waters of Laurel Run, 3 miles southeast of Mabie, at an elevation of 2990′ B., had fallen shut and could not be measured. The following local mine is still in operation on what has long been known as the Hart property:

Grace Hart Johnson Farm Mine—No. 1044 on Map IV.

On Rich Mountain, at the head of Laurel Run, 3.2 miles southeast of Mabie; Sewell Coal; elevation, 3010′ B.

	Ft.	In.
Slate, black		
Coal, soft, with streaks of mineral charcoal	3	10
Slate, black, bony	1	0
Slate, pavement		

A sample was collected at this opening, the composition of which is published under **Mine No. 1044** in the table of coal analyses at the end of this Chapter.

The coal was once opened at **Prospect No. 1045 on Map IV,** on a branch of Laurel Run of Roaring Creek, 2.5 miles southeast of Mabie, at an elevation of 2700′ B., but the place had fallen shut and could not be measured. The **Taylor George Farm Mine (No. 1046 on Map IV),** located on a branch of Laurel Run of Roaring Creek, 2.5 miles southeast of Mabie, measured 3′ 9″ of clean, soft coal, at an elevation of 2850′ B.

In the Middle Fork River region of Roaring Creek District, the two following openings were noted:

Farm Mine—No. 1047 on Map IV.

On Middle Fork River, at the mouth of Long Run, 2.4 miles north of Long; Sewell Coal; elevation, 1900′ B.

			Ft.	In.
Sandstone, massive				
Coal, soft	1′	10″		
Slate, black	0	1		
Coal, soft	1	7	3	6
Slate, pavement, and concealed, to Long Lun			5	0

Farm Mine No. 1048 on Map IV, located on Long Run, 2 miles north of Long, at an elevation of 1910′ L., had fallen shut and could not be measured.

Sewell Coal, Middle Fork District, Randolph.

In Middle Fork District, the Sewell Coal has been opened at numerous points and has been mined on a commercial scale, furnishing a most excellent coal at nearly all points where it has been used. Several openings have been made on the waters of Middle Fork River, the following having been noted on Long Run:

Elijah Newlon Farm Mine—No. 1049 on Map IV.

On Long Run, 0.7 mile north of Long; Sewell Coal; elevation, 2045′ B.

		Ft.	In.
Sandstone			
Coal, soft	2′ 8″		
Coal, bony	0 4	3	0
Concealed to Long Run			

The three following openings are reported by Teets:

Hartford Newlon Farm Mine—No. 1050 on Map IV.

On Long Run, 0.6 mile west of Long; Sewell Coal; elevation, 2065′ B.

		Ft.	In.
Sandstone			
Coal	2′ 8″		
Coal, bony	0 4	3	0

Ira Shockey Farm Mine—No. 1051 on Map IV.

On Long Run, at Long; Sewell Coal; elevation, 2120′ B.

		Ft.	In.
Sandstone			
Coal, soft	3′ 0″		
Coal, bony	0 6	3	6
Slate, pavement			

A sample was collected from this opening, the composition of which is published under **Mine No. 1051** in the table of coal analyses at the end of this Chapter.

J. A. Enlow Farm Mine—No. 1052 on Map IV.

On Long Run, 0.4 mile north of Loda; **Sewell Coal**; elevation, 2300' B.

			Ft.	In.
Sandstone, massive, roof, visible			5	0
Coal, soft	2'	7"		
Coal, bony	0	10	3	5
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 1052** in the table of coal analyses at the end of this Chapter.

The coal was once opened at **Prospect No. 1053 on Map IV,** on Long Run, at Loda, but the place had fallen shut and could not be measured, its elevation being 2380' B.

On Middle Fork River, several openings have been made in the vicinity of Cassity, the following having been noted:

Moore-Keppel & Company Prospect—No. 1054 on Map IV.

On Middle Fork River, 1.2 miles northwest of Cassity; **Sewell Coal**; elevation, 2115' B.

			Ft.	In
Slate, dark				
Coal, soft	2'	10"		
Slate, bony, visible	0	6	3	4

At the following opening, the coal has been mined for railroad, steam, and domestic fuel, by Moore-Keppel & Company for its various lumber operations:

Moore-Keppel & Company Mine—No. 1055 on Map IV.

On Middle Fork River, 0.8 mile northwest of Cassity; **Sewell Coal**; elevation, 2040' B.

			Ft.	In.
1. Sandstone, massive, visible			10	0
2. Coal, soft	2'	6"		
3. Coal, bony	1	0	3	6
4. Slate, pavement				

A sample was collected from No. 2 of section, the composition of which is published under **Mine No. 1055** in the table of coal analyses at the end of this Chapter.

The **Frank Phares Prospect (No. 1056 on Map IV)**, located on Middle Fork River, 0.7 mile northwest of Cassity, at an elevation of 2055′ B., had fallen shut and could not be measured.

R. O. Zirkle Farm Mine—No. 1057 on Map IV.

On Middle Fork River, 0.5 mile northwest of Cassity; **Sewell Coal**; elevation, 2030′ B.

			Ft.	In.
1.	Sandstone, massive		10	0
2.	Coal, soft	2′ 7″		
3.	Coal, bony	0 8	3	3
4.	Slate, pavement			

A sample was collected from No. 2 of section, the composition of which is published under **Mine No. 1057** in the table of coal analyses at the end of this Chapter.

At the extreme head of Cassity Fork, the coal comes to the surface near the crest of Rich Mountain where the two following openings were found:

Clarence (?) Lutz Prospect—No. 1058 on Map IV.

On a branch of Cassity Fork, 4.5 miles east of Cassity; **Sewell Coal**; elevation, 3005′ B.

		Ft.	In.
Slate, dark		10	0
Coal, soft	4′ 0″		
Coal, bony	1 2	5	2
Slate, pavement			

The **J. W. Pingley Prospect (No. 1059 on Map IV)**, located on the same branch of Cassity Fork, 4.6 miles east of Cassity, at an elevation of 3050′ B., had fallen shut and could not be measured, its thickness being reported more than 9 feet. It is quite probable that the measurement was taken at a point where the bed stood at a considerable angle, as this thickness is much greater than was observed at any opening.

The following opening was noted by Teets near the summit of Rich Mountain, on another branch of Cassity:

William Currence Farm Mine—No. 1060 on Map IV.

On Panther Run of Cassity Fork, 4.7 miles southeast of Cassity; **Sewell Coal**; elevation, 3035′ B.

			Ft.	In.
Sandstone, massive			6	0
Coal	2′	6″		
Coal, bony	0	8	3	2
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 1060** in the table of coal analyses at the end of this Chapter.

On Three Forks Run two openings have been made in the Sewell and one of these is reported as follows by Teets:

A. J. Long Farm Mine—No. 1061 on Map IV.

On Middle Fork River, at the mouth of Three Forks Run, 0.5 mile southwest of Cassity; **Sewell Coal**; elevation, 2040′ B.

			Ft.	In.
Sandstone, roof				
Coal, very soft	2′	2″		
Coal, soft	1	8	3	10
Slate, pavement				

The other opening shows the following structure:

A. J. Long Farm Mine—No. 1062 on Map IV.

On Three Forks Run, 0.7 mile southwest of Cassity; **Sewell Coal**; elevation, 2070′ B.

			Ft.	In.
Sandstone, massive			5	0
Coal, soft	2′	10″		
Coal, bony	1	7	4	5
Slate, pavement				

Some valuable tests, principally of the Sewell Coal near Cassity, have been made for C. W. Maxwell, of Elkins, and others, and through the courtesy of Mr. Maxwell, these have been placed at the disposal of the Survey, the results being as follows:

Tests of Sewell Coal from A. J. Long Mine (No. 1061) at mouth of Three Forks, near Cassity, Randolph County.

Analysis.

	Per cent.
Moisture	1.18
Volatile Matter	27.80
Fixed Carbon	65.12
Ash	5.90
Total	100.00
Sulphur	0.67
Phosphorus	0.032

Pittsburgh Testing Laboratory,

Lab. No. 38853. (Signed) Jas. O. Handy, Chief Chemist.

Coking Test.

Where Coked—Mt. Hope Coke Co. oven, Fayette, Co., Pa.
Type of coal charged—5″ by 30″ rectangular.
Amount charged—ten tons.
Depth of coal in coke oven—2 ft. 4 in.
Time of burning—48 hours.
Depth of coke in oven—2 ft. 6 in.
Appearance of coke when made—Good, firm, and with silvery lustre.
Method of drawing coke—Pushing ram.
Disposition of coke to push—More readily than Connellsville coke.
Combustion action in oven—Coal inclined to expand slightly to side walls of oven, fissured well in coking, general action good.
Debris of breeze attendant—Perceptibly less than Connellsville coke.
Size of coke—Fairly passive, considerable horizontal fracture in structure.
Condition of coke oven—Good.
Heated condition of oven previous to charging—Low: Coal charged in oven Tuesday, March 4th, after a 72-hour charge had been drawn, consequently oven would be at lowest temperature.

Remarks:

As the Superintendent of Mt. Hope Coke Company had no previous experience with the coking of this class of coal, the methods in service for coking Connellsville coals were adhered to throughout and without the slightest deviation therefrom, the wisdom of which is shown in the result obtained. It is probable that the regulation of air when the coal was burning would have produced even more favorable results, but under the condition, experiment could not be resorted to, and at least this test has established the fact that New River coal of the quality coked has made a good record.

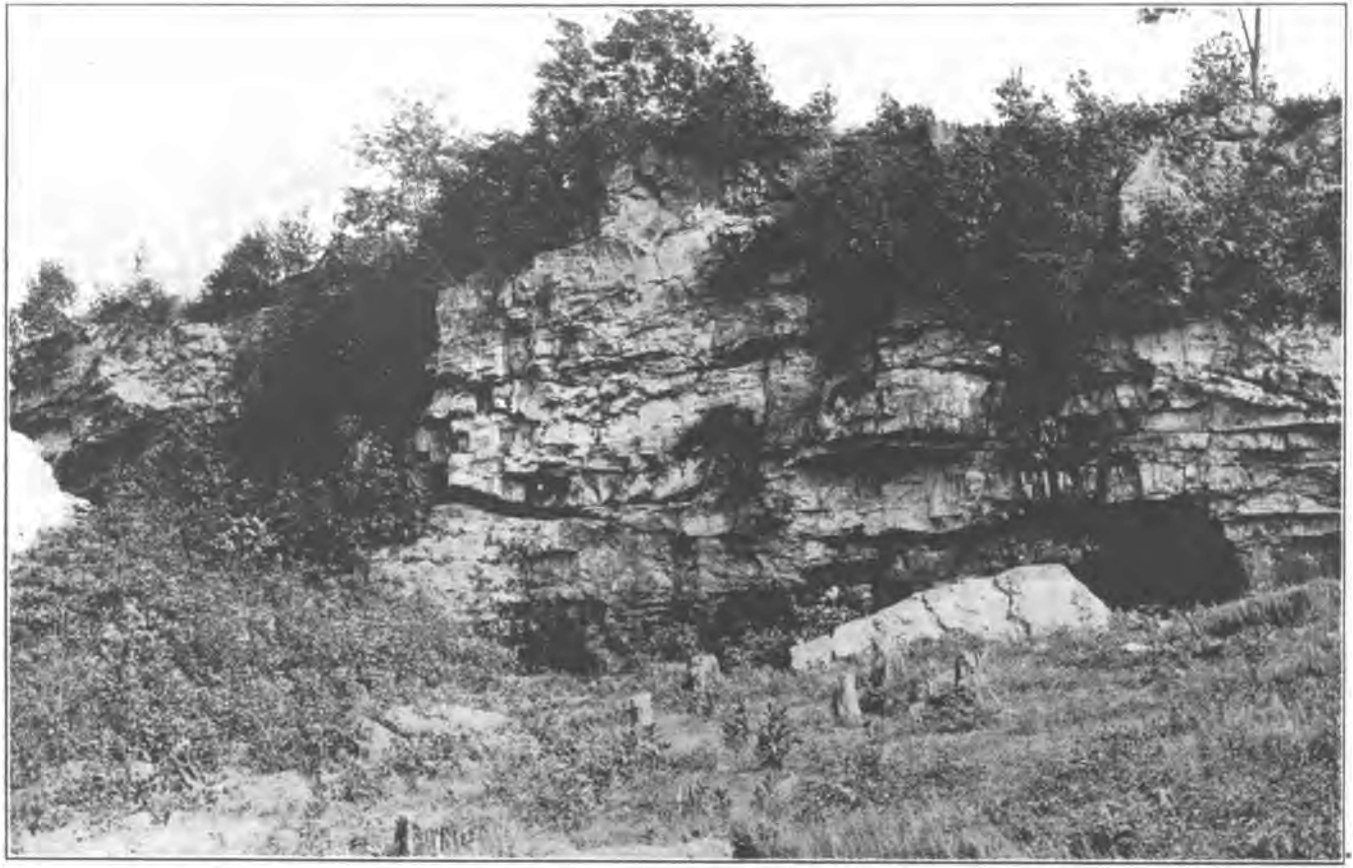

PLATE XLI.—Homewood Sandstone on Tenmile Creek, Upshur County, showing cross-bedding and characteristic fracture.

Analysis of Coke.

	Per cent.
Moisture	0.18
Volatile Matter	0.62
Fixed Carbon	90.78
Ash	8.42
Total	100.00
Sulphur	0.52
Phosphorus	0.012
Crushing strength, 1" cube, by pounds	3.940
Specific gravity	1.71
Apparent specific gravity	.914
Per cent. of cells by volume	46.74
CC in 100 grams	51.33

Analysis No. 29331. The Metallurgical Laboratory,

Pittsburgh, Pa., March 15, 1913. (Signed) Jos. J. Miller, Mgr.

Remarks:

The coal from which this coke was manufactured had an unusual and effective mixing, as follows: I.—Mined. II.—Loaded in mine car. III.—Dumped from mine car to platform. IV.—Loaded from platform into wagons and hauled to railroad car. V.—Unloaded from wagons into car. VI.—Shoveled back in car. VII.—Unloaded and reloaded into second railroad car at Belington, W. Va. VIII.—Unloaded from car on to ground at Mt. Hope, Pa. IX.—Reloaded into wagon and hauled to mine cars. X.—Unloaded into mine cars. XI.—Dumped from mine cars into Charging Larry. XII.—From Larry into coke oven.

By-Product Coking Test.

Formation and Series—Middle Pottsville. Series XII
Coal Vein—Fire Creek No. 8 or Beckley No. 9 (Sewell, D. B. R.).
Size of coal vein—48 to 50 inches.
Appearance of coal vein—Good, a shining black coal.
Foreign mixture of strata—No strata, some thin shale at top of coal vein. No material affecting coal.
Roofing of coal vein—Sandstone. Clay mixed at top of vein.
Situation—Middle Fork River, Randolph County, W. Va.

Proximate Analysis.

	Per cent.
Moisture	29.10
Fixed Carbon	68.00
Ash	2.90
Total	100.00
Sulphur	0.80

Distillation Yield.

	Per cent.
Tar	4.116
Free Ammonia (NH_3)	0.270
Combined Ammonia (NH_3)	0.048
Water	4.511
Carbon Dioxide (CO_2)	0.845

		Per cent.
Sulphuretted Hydrogen (H_2S)		0.204
Gas by weight		13.794
Total Volatile Matter		23.788
Coke Yield		76.212
Coke Yield by much (?)		72.780
Ammonia as Sulphate	Free	1.080
	Combined	0.192
	Total	1.272

Equivalents per net ton of coal:

Cubic feet of Gas—0°C, No. 0, (Hg. Dry, excl. CO_2 & H_2S. 8990 Incl. 9187. (15°C, 3) Hg. Sat., excl. CO_2 & H_2S 9546 Incl. 9858.

Practical Yield.

Gallons of tar	5.4
Pounds of Sulphate	18.0

Alan Wood Iron and Steel Company Report on Coals Along Middle Fork River, Randolph County, April 28, 1914.

Mine No. on Map IV.	1064	990	1060	1061
Coal Seam	Sewell	Eagle	Sewell	Sewell
Name of Mine.	E. E. Shiflett	Lloyd Zickefoose.	W. D. Currence.	A. J. Long
Location.	Laurel Branch.	Three Forks.	Head of Cassity.	Mouth of Three Forks.
Sample No.	1842	1843	1844	1845
Volatile Matter	29.75	31.55	30.20	27.60
Fixed Carbon	67.90	65.65	64.97	65.90
Ash	3.35	3.00	4.83	6.50
Sulphur	0.618	0.717	0.894	0.824

Two openings were noted by Teets on Laurel Branch, as follows:

Henry Moats Farm Mine—No. 1063 on Map IV.

On Laurel Branch of Middle Fork River, 2.1 miles northeast of Adolph; Sewell Coal; elevation, 2880′ B.

			Ft.	In.
Slate				
Coal, soft	1′	9″		
Shale, gray	0	7		
Coal, bony	1	0	3	4

A sample was collected from this opening, the composition of which is published under **Mine No. 1063** in the table of coal analyses at the end of this Chapter.

Arthur Shiflett Farm Mine—No. 1064 on Map IV.

On Laurel Branch of Middle Fork River, 3.2 miles northeast of Adolph; **Sewell Coal**; elevation, 2600′ B.

			Ft.	In.
Sandstone, massive, roof				
Coal, soft	1′	11″		
Coal, bony	1	2	3	1
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 1064** in the table of coal analyses at the end of this Chapter.

On the waters of Buckhannon River, several openings have been made, one of which Teets reports as follows on the waters of Right Fork:

Emil Metzner Farm Mine—No. 1065 on Map IV.

On Saltlick Run of Left Fork of Right Fork of Buckhannon River, 1.7 miles southeast of Helvetia; **Sewell Coal**; elevation, 2405′ B.

			Ft.	In.
Slate				
Coal, soft	1′	7″		
Slate, gray, hard	0	1		
Coal, soft	0	9		
Shale, gray	0	1		
Coal, hard, bony	0	6	3	0
Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 1065** in the table of coal analyses at the end of this Chapter.

On Left Fork the following prospect, noted by Teets, is the most northern exposure of the Sewell observed on this branch:

Elkhorn Coal Corporation Prospect—No. 1066 on Map IV.

On Left Fork of Buckhannon River, 1 mile southwest of Star; **Sewell Coal**; elevation, 2690′ B.

	Ft.	In.
Sandstone, gray, visible	5	0
Slate, dark, with iron ore nodules	4	0

		Ft.	In.
Coal, soft	1' 11"		
Slate, gray	0 1		
Coal, bony	0 10	2	10
Slate, pavement			

Farther up the same fork, the coal was once mined commercially by the Rich Mountain Coal Company at Beech Run and Hartridge, but since the property has been acquired by other interests both mines have been abandoned temporarily and their entrances sealed with concrete barriers, making it impossible to enter them and secure sections and samples. The following measurement was made at the entrance to the old Beech Run Mine:

Elkhorn Coal Corporation, Beech Run Mine—No. 1067 on Map IV.

On Beech Run, at Beech Run village; Sewell Coal; elevation, 2690' B.

		Ft.	In.
Coal, rotten, Sewell "B"		2	4
Shale, dark, soft		1	0
Shale, dark, harder, with numerous plant fossils		8	0
Coal, soft, columnar	2' 7"		
Coal, bony	0 3 Sewell	2	10
Slate, pavement			

Another old opening on the same run is reported as follows by Teets:

Elkhorn Coal Corporation, Beech Camp Mine—No. 1068 on Map IV.

On Beech Run, 1.6 miles south of Beech Run village; Sewell Coal; elevation, 2760' B.

		Ft.	In.
Slate			
Coal, soft	3' 0"		
Coal	0 6	3	6
Slate, pavement			

A sample was collected from this opening, the composition of which is published under **Mine No. 1068** in the table of coal analyses at the end of this Chapter.

The **Elkhorn Coal Corporation, Hartridge Mine (No. 1069 on Map IV)**, located on Left Fork of Buckhannon at Hartridge, with an elevation of 2735′ B., where the coal was formerly mined commercially by the Rich Mountain Coal Company, was sealed with concrete and no coal was visible at outcrop, making it impossible to obtain a measurement. The **Daniel Tenney Farm Mine (No. 1069A on Map IV)**, located on the west side of the river at Hartridge, with an elevation of 2735′ B., had also fallen shut.

Several samples of the Sewell Coal were collected by Hart Brothers, of Clarksburg, former owners of the Rich Mountain Coal Company, from Buckhannon River and Rich Mountain, which were analyzed by the Survey and the results published in Bulletin 2, pages 252-254 (1911). These analyses, together with the comments of Dr. White, are herein republished in full because they furnish the only available information on these abandoned mines:

"In recent months these New River coals have been opened for commercial shipments by the Rich Mountain Coal Co., owned principally by Hart Bros., of Clarksburg, along the line of the Alexander and Eastern Railway on the Left Fork of the Buckhannon River, in Randolph County. The following analyses of these New River coals from Randolph County, made in the Survey Laboratory, will give a good idea of their quality:

	1	2	3	4	5	6	7	Ave.
Moisture	0.57	0.80	0.93	1.33	0.56	0.87	0.73	0.83
Volatile Matter	29.89	29.40	29.07	30.77	27.14	31.01	26.27	29.08
Fixed Carbon	67.69	64.68	66.19	65.54	64.42	63.96	63.58	65.15
Ash	1.85	5.12	3.81	2.36	7.88	4.16	9.42	4.94
Totals	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Sulphur	0.91	0.71	0.98	0.58	1.52	0.58	0.73	0.86
Phosphorus	0.018	0.006	0.006	0.014	0.027	0.008	0.009	0.013
B. T. U.	15196				14489			

"Location of Samples.

No. 1. Coal (most probably Sewell) from Holland farm, Rich Mountain, Randolph County, W. Va.

No. 2. Beech Run Mine (No. 1067 on Map IV, D. B. R.), Rich Mountain Coal Co., Randolph County, W. Va.

No. 3. Tenney Mine (No. 1069 or 1069A on Map IV, D. B. R.), Rich Mountain Coal Co., Randolph County, W. Va.

No. 4. 'Camp No. 11,' Rich Mountain Coal Co., Randolph County, W. Va.

No. 5. Coal from old opening, top of Rich Mountain, near Elkins, Randolph County, W. Va.

No. 6. Hart Mine (No. 1044 on Map IV, D. B. R.), top of Rich Mountain, Randolph County, W. Va., near Beverly.

No. 7. Coal from old opening, top Rich Mountain, near Elkins, Randolph County, W. Va.

"These analyses speak for themselves in revealing coals of great excellence. The volatile matter, it will be noted, is considerably higher than on New River, and the coal would certainly yield a coke of great purity.

"The ultimate analyses of samples 1 and 5 were also determined by Prof. Hite with the following results:

	1	5
Carbon	83.00	79.55
Hydrogen	5.48	5.41
Oxygen	7.32	4.46
Nitrogen	1.44	1.18
Sulphur	0.91	1.52
Ash	1.85	7.88
Totals	100.00	100.00
Calorimeter B. T. U.	15,196	14,489
Calculated B. T. U.	14,937	14,639

"The Rich Mountain Coal Company has built some beehive ovens to coke these New River coals at the head of the Left Fork of the Buckhannon River in Randolph County, and the results have proven very satisfactory, according to Messrs. Hart Bros., who report the analysis of their coke made by Messrs. Smith, Rudy & Co., of Philadelphia, as given below. A sample of this coke made at the Hartridge mine was also sent to the Survey office for analysis, and the results are given below:

	Analysis made by Smith, Rudy & Company.	Analysis made by W. Va. Geol. Survey.
Moisture	0.21	0.36
Volatile Matter	1.16	0.29
Fixed Carbon	93.71	92.68
Ash	4.92	6.67
Totals	100.00	100.00
Sulphur	0.83	0.82
Phosphorus	0.005	0.010

"These analyses reveal a coke of the very highest quality for metallurgical purposes, being very low in both ash and sulphur and high in fixed carbon, with most excellent cell structure and bright silvery lustre."

The **Elkhorn Coal Corporation Prospect (No. 1070 on Map IV)**, located at the junction of Morgan Camp and Phillips

Camp Runs, 0.8 mile south of Hartridge, had
could not be measured, its elevation being 27

In that portion of Middle Fork Distric
Pickens, and drained by the waters of Sugar
Fork of Elk River, only a few mines and pros
made in the Sewell, but these reveal a coal
the following having been noted:

Ranwood Lumber Company Exposure—No. 1

On Sugar Creek, 4.3 miles south of Pickens; S
tion, 2575′ B.

Sandstone, massive..............................
Shale, black, Hartridge........................
Coal, soft......................................
Fire clay shale, gray, with plant fossils.........
Shale, dark, with ferriferous limestone, to creek

The following mine lately opened on the
Tract supplies coal for the locomotives of the
ber Company on its narrow gauge line to Pic

Ranwood Lumber Company Mine—No. 107

On Sugar Creek (Holly District, Webster), 5 mi
ens; Sewell Coal; elevation, 2550′ B.

Sandstone, shaly................................
Shale, sandy, dark..............................
Coal, medium-soft...............................
Slate, pavement.................................

A sample was collected from this place
was driven into the hill, the composition of wh
under **Mine No. 1072** in the table of coal anal
of this Chapter.

Another sample, collected by the Lu
farther under the hill and analyzed in the la
Survey, shows the following:

	Per cent.
Moisture	0.96
Volatile Matter	31.81
Fixed Carbon	62.44
Ash	4.79
Total	100.00
Sulphur	0.56

A sample of the coal from this mine, collected by Mr. A W. Ewing, of Pickens, W. Va., and analyzed by the Sandusky Cement Company, of Cleveland, Ohio, yielded the following results as reported by Wm. B. Newberry, Assistant Manager:

	Per cent.
Volatile matter	29.73
Fixed carbon	64.20
Ash	6.07
Total	100.00
Iron oxide in ash	3.72
Iron oxide in coal	0.23
Color of ash	light buff

The Middle Fork District Line extends south as far as Back Fork of Elk River, practically all of this southern area being virgin or cut-over woodland where a few coal prospects have been made. The two following openings were observed in the Sewell Coal, one of which is just across the line in Webster County:

Coal Prospect—No. 1073 on Map IV.

On Back Fork of Elk River (Holly District, Webster), 2 miles northeast of Waneta; **Sewell Coal**; elevation, 2700′ B.

		Ft.	In.
Shale, dark, sandy		20	0
Coal, soft	3′ 10″		
Coal, bony	0 6	4	4
Fire clay, gray, with plant fossils		4	0

The gray fire clay shale, with numerous plant roots, is a typical feature of the floor of the Sewell Coal all the way through the Rich Mountain and Point Mountain region of Randolph County.

Coal Prospect—No. 1074 on Map IV.

On Hull Camp Run of Back Fork of Elk River, 2.8 miles northeast of Waneta; **Sewell (?) Coal**; elevation, 2820′ B.

	Ft.	In.
Slate, black		
Coal, hard, splinty	1	6
Shale, sandy, visible	2	0

There is considerable doubt as to whether this prospect represents the Sewell Coal, as its thickness is not sufficient and it lacks the typical bony coal and the plant shale at the base. It might be that further prospecting would reveal the full thickness of Sewell Coal at this locality.

Mr. Lee A. Hamrick, of Waneta, according to his own report, has recently prospected this coal on Mitchell Run, finding a thickness of 3′ 0″. He has also partially opened it on Zimmerly Run, where it shows the following:

Holly Lumber Company Prospect—No. 1074A on Map IV.

On Zimmerly Run of Back Fork of Elk River, 1.8 miles south of the Parting Springs; **Sewell Coal**; elevation, 2985′ B.

	Ft.	In.
Coal blossom, not opened up		
Sandstone, massive	5	0
Slate, black	4	0
Coal	1	6
Fire clay shale to run	5	0

Sewell Coal, Huttonsville District, Randolph.

Only a small strip of land along the western edge of Huttonsville District is underlain with coal, as the eastward rise of the rocks toward the great arch that parallels the Tygart Valley River has elevated the coal measures to a great height and they have been eroded over most of the District. According to Teets, the coal was once opened at the **Jacob and Mike Bosworth Farm Mine (No. 1075 on Map IV)**, located on a branch of Mill Creek, just east of the crest of Rich Mountain, and 2.4 miles northeast of Adolph. This old opening had fallen shut and could not be measured, its elevation being 2910′ B.

On the main Mill Creek, the coal was once opened and mined on a semicommercial basis when lumber operations were in active progress along that stream, but since the timber work has ceased, the mines have been abandoned owing to their inaccessibility through the removal of the railroad. The following is a section made at the mouth of the east opening of the old mine:

H. G. Davis Heirs Mine (Abandoned)—No. 1076 on Map IV.

On Mill Creek, 2.7 miles west of Lee Bell; **Sewell Coal**; elevation, 2730′ B.

			Ft.	In.
Sandstone, massive				
Concealed, sandy shale, and dark slate			15	0
Coal, soft	1′	5″		
Slate, bony	0	6		
Coal, soft	2	0	3	11
Concealed to massive sandstone			30	0

A sample was once collected from this mine by Dr. White, the composition of which is published under **Mine No. 1076** in the table of coal analyses at the end of this Chapter. Dr. White's visit to this locality was made at a time when the active lumber and coal operations gave better opportunity for observing these coals than is possible on account of the wilderness of briers and brush that now covers this region. His valuable discussion of this region is available in Volume II(A), pages 238-240, to which the reader is referred.

The following section was measured at the central opening directly north of the old tipple:

H. G. Davis Heirs Mine (Abandoned)—No. 1077 on Map IV.

On Mill Creek, 2.7 miles west of Lee Bell; **Sewell Coal**; elevation, 2710′ B.

			Ft.	In
Slate, black				
Coal, soft	1′	0″		
Slate, black	0	6		
Coal, soft	2	0		
Coal, bony	0	5	3	11
Shale, gray, with plant fossils				

The following very interesting section was measured at the mouth of the west opening which is now completely fallen shut:

H. G. Davis Heirs Mine (Abandoned)—No. 1077A on Map IV.

On Mill Creek, 2.7 miles west of Lee Bell; **Sewell Coal**; elevation, 2705′ B.

	Ft.	In.
Sandstone, massive	10	0
Shale, dark, sandy	6	0
Coal, slaty	0	9
Slate, black, with plant fossils and hard lentils containing **Naiadites**, **Hartridge Shale**	5	0
Coal, thickness concealed, main bed		

The fossils found in the roof shales of the coal at this point are the same as those found in such profusion at Hartridge and which have been later found at numerous points across Webster County in the roof shales of the Sewell Coal.

In the discussion of this region by Dr. White, as noted above, an exposure of the Sewell Coal is mentioned in Stonecoal Run about two miles above the Davis mine and about one-fourth mile above the mouth of the run, showing a total of 5′ 3″ of the coal and slate. This exposure the writer was unable to locate so as to place it definitely on the map.

Sewell Coal, Mingo District, Randolph.

In Mingo District, the Sewell Coal is exposed along Point Mountain south of the Back Fork of Elk River, where there is a fine body of exceptionably pure coal. Several openings are available, the following mine having been recently started on the land of the Holly Lumber Company:

Croft Lumber Company Mine—No. 1078 on Map IV.

On Back Fork of Elk River, 1.8 miles south of the Parting Springs; **Sewell Coal**; elevation, 3000′ B.

			Ft.	In.
1. Slate, dark				
2. **Coal**, slaty	1′	8″		
3. Shale, gray, 3′ 0″ to	1	0		
4. **Coal**, soft, columnar	3	8	6	4
5. Slate, pavement				

"Principal office, Alexander; coal owned by Holly Lumber Company; present daily capacity, 35 tons; 9 men employed; coal used for locomotives on Alexander and Eastern Railroad; sample collected from No. 4 of section in Main Heading; R. M. Chandler, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 1078** in the table of coal analyses at the end of this Chapter.

The coal is also reported to have been opened on the Back Fork at the Lutz Lumber Camp, located 1.4 miles southeast of the Parting Springs, its exact thickness not being noted.

The **Hale and Kenney Prospect (No. 1079 on Map IV)**, located on Vandevender (Coalbank) Fork, 3.8 miles northwest of Monterville, measured 3′ 7″ of clean coal, at an elevation of 3260′ B. The **Strader Heirs Prospect (No. 1080 on Map IV)**, located on Vandevender Fork, 3.3 miles northwest of Monterville, at an elevation of 3460′ B., had fallen shut, its thickness being reported 3 feet by Lee A. Hamrick.

William Vandevender Heirs Farm Mine—No. 1081 on Map IV.

On Vandevender Fork of Back Fork, 2.5 miles northwest of Monterville; **Sewell Coal**; elevation, 3530′ B.

			Ft.	In.
1.	Sandstone, shaly			
2.	Coal, soft, columnar	3′ 8″		
3.	Slate, bony	0 10	4	6
4.	Slate, pavement			

A sample was collected from No. 2 of section, the composition of which is published under **Mine No. 1081** in the table of coal analyses at the end of this Chapter. It will be noted that the same bony slate or bony coal is visible here as at other mines farther north.

The following opening is reported by Teets on the east side of Rich Mountain on the Tygart Valley drainage:

Lee Swecker Farm Mine—No. 1082 on Map IV.

On Stony Run of Elkwater Fork of Tygart Valley River, 2.3 miles northwest of Monterville; **Sewell Coal**; elevation, 3535′ B.

		Ft.	In.
Sandstone, shaly			
Coal, soft	3′ 0″		
Coal, bony	0 8	3	8
Slate, pavement			

The two openings noted above are at the angle where the Rich Mountain veers suddenly westward toward Webster Springs, being given the name of Point Mountain in distinction to the former name which is applied only to the north leg of the angle. Several openings have been made along Point Mountain, some of them being on the Back Fork side and some on the waters of Valley Fork of Elk.

The **Davis and Elkins Prospect (No. 1083 on Map IV)**, located on Point Mountain at the head of Hewett Fork of Back Fork of Elk, at an elevation of 3695 feet, had been opened by stripping, the hole being partly full of water. Above the water 3′ 0″ of clean coal was visible, the total depth from the top of the coal to the bottom of the pit being 4′ 2″, the lower portion of which probably includes the usual streak of bony coal. The **Hale and Kenney Prospect (No. 1084 on Map IV)**, located on Point Mountain on Redlick Run of Valley Fork, at an elevation of 3600′ B., had fallen shut, the coal being reported 3′ 10″ thick by Lee A. Hamrick.

S. C. Riggleman Farm Mine—No. 1085 on Map IV.

On Redlick Run of Valley Fork of Elk, on south side of Point Mountain; **Sewell Coal**; elevation, 3530′ B.

		Ft.	In.
Sandstone, shaly			
Slate, dark			
Coal, medium-hard	3′ 6″		
Coal, bony	0 2	3	8
Sandstone, massive		12	0
Coal, reported		1	6

Hale and Kenney Farm Mine—No. 1086 on Map IV.

On south side of Point Mountain at the head of Hickorylick Run of Valley Fork of Elk, 2.4 miles northwest of Blue Spring; Sewell Coal; elevation, 3425′ B.

	Ft.	In.
Slate, dark		
Coal, hard, splinty	**5**	**2**
Slate, pavement		

A sample was collected from this opening, the composition of which is published under **Mine No. 1086** in the table of coal analyses at the end of this Chapter.

The **Hale and Kenney Farm Mine (No. 1087 on Map IV)**, located on the south side of Point Mountain at the head of Hickorylick Run of Valley Fork, 2.7 miles northwest of Blue Spring, at an elevation of 3400′ B., measured 3′ 6″ of clean, medium-hard coal.

Besides these openings noted on Point Mountain, there is a considerable body of good Sewell Coal in the top of Elk Mountain south of Valley Fork and also in the top of Gauley Mountain southwest of the sharp angle that Elk River makes at the mouth of Valley Fork. These areas have been prospected but little, yet they are known to have been proved at a few points and such information as is available on the coals of this region will be presented in the forthcoming report on Webster County. East of Elk Mountain the coals have disappeared along the great structural arch that parallels the Tygart Valley.

Quantity of Sewell Coal Available.

The foregoing sections furnish a fair idea of the nature of the Sewell Coal in the region of its outcrop. In addition to these, several bore hole records have been published on previous pages of this Chapter that record its presence and these may be readily referred to. The accompanying table gives a list of oil and gas wells that record it at a few points northwest of its line of outcrop, indicating that there may be some minable areas of this coal under drainage in this region that must, however, be tested with the diamond drill to prove their worth. Another table is added showing the probable amount of Sewell Coal available as determined with planimeter by Tucker from the surface and underground areas outlined for it on Maps II and IV and Figure 20.

List of Oil and Gas Wells Recording Sewell (Sharon?) Coal.

	Location.	Name of Well.	Elevation of well mouth. A. T.	Depth to Coal. Feet.	Thickness. Feet.
	Upshur County:				
58	Geo. Burner No. 1.......	Sago	1432L	712	4
84	Silica Sand Co. No. 3....	Craddock, 0.3 mi. N. W.	2505B	865	4
88	Silica Sand Co. No. 2....	Craddock, 0.2 mi. N.....	2035B	470	5
89	Sherman Heirs No. 1....	Craddock, 0.5 mi. N. E..	2025B	390	6

Probable Amount of Sewell Coal.

Counties by Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Barbour:					
Barker	2	5.05	3,232	281,571,840	11,262,874
Upshur:					
Washington	2	34.35	21,984	1,915,246,080	76,609,843
Banks	2	8.40	5,376	468,357,120	18,734,285
Totals		42.75	27,360	2,383,603,200	95,344,128
Randolph:					
Leadsville	2	8.43	5,395	470,012,400	18,800.496
Roaring Creek...	3	56.80	36,352	4,750,479,360	190,019.174
Middle Fork.....	3	153.70	98,358	12,854,730,240	514,189,210
Huttonsville	3	11.60	7,424	970,168,320	38,806,733
Mingo	3	14.65	9,376	1,225,255,680	49,010,227
Totals		245.18	156,915	20,270,646,000	810,825,840
Totals for Area..............		292.98	187,507	22,935,821,040	917,432,842

WELCH COAL.

In the Elk River region of Webster County, just west of the Randolph Line, a fine seam of good soft coal has been frequently found at an interval of about 40 feet below the Sewell. This coal apparently correlates with the Welch Coal of the New River Group and probably extends eastward a considerable distance into the Back Fork and Sugar Creek region of Randolph County. The following is the only exposure noted, being in Mingo District:

Holly Lumber Company Coal Exposure—No. 1088 on Map IV.

On Back Fork of Elk River, 1.7 miles south of the Parting Springs; Welch Coal; elevation, 2950' B.

	Ft.	In.
Sandstone and concealed......................		
Coal, visible................................	3	0
Fire clay shale and sandstone to river..........	15	0

This coal comes only a few feet above the Mauch Chunk Red Shale which is visible on the north side of the river a short distance westward from this exposure.

The scarcity of prospects in this coal makes its value somewhat problematical, but further digging would doubtless reveal it at other points along Back Fork. Until further evidence is available, no figure can be made showing the extent of its occurrence and for the same reason its outcrop is not shown on Map IV.

SUMMARY OF AVAILABLE COAL.

For convenience of reference, all the mines and prospects described in this Report have been given serial numbers which are printed in blue on Maps II and IV, along with the conventional mine symbols. Disregarding those that are applied to thin coals that have no commercial significance, the following table gives a list of these numbers that refer to the 17 commercial seams described in the present Chapter, as well as a summary of the total amount of coal that each seam is estimated to contain:

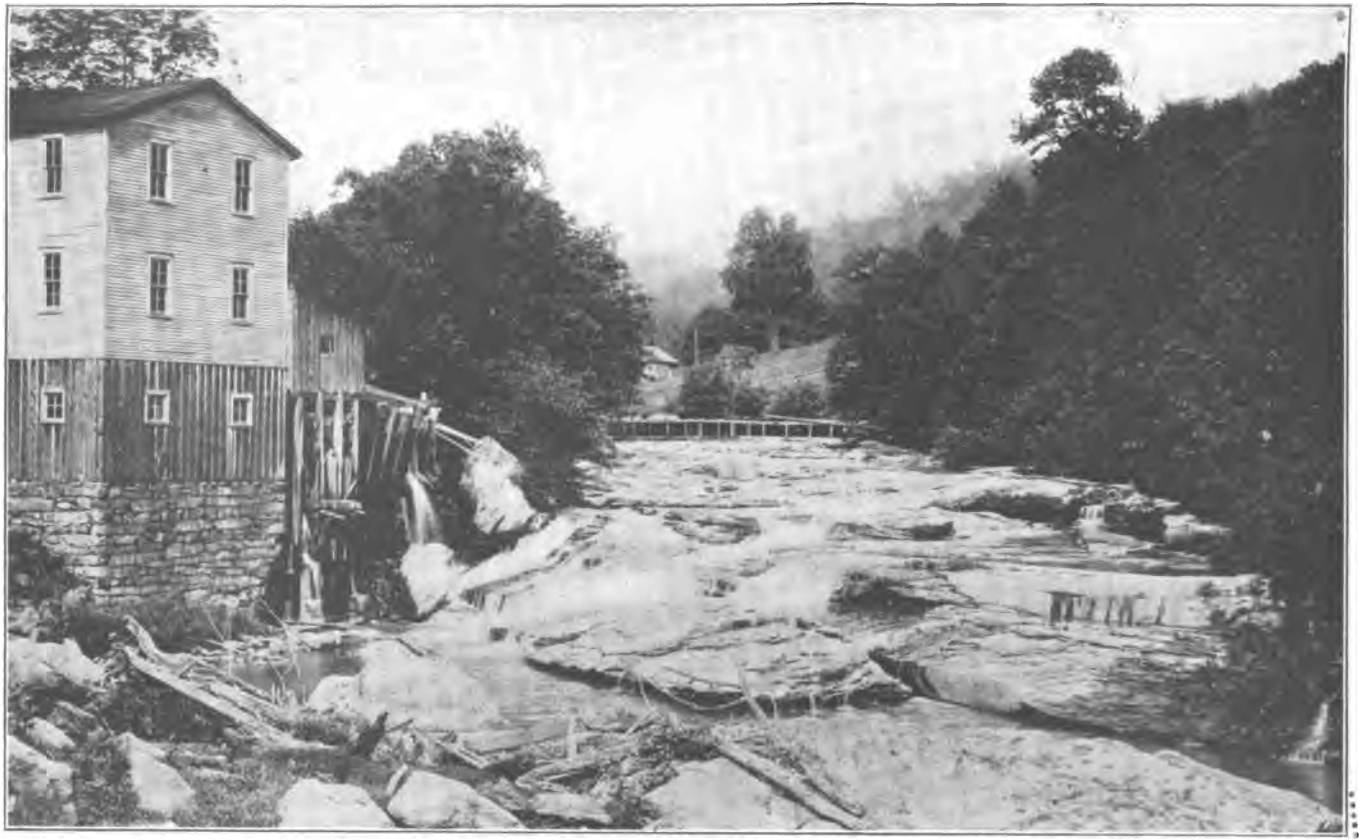

PLATE XLII.—Falls of Little Kanawha River over Upper Connoquenessing Sandstone ledge at Arlington, Upshur County.

Coal Seams	Mines and Prospects Listed on Maps II or IV and Described in Chapter XI	Short Tons (2000 Lbs.) of Coal.		
		Barbour County	Upshur County	Western Portion of Randolph County
Redstone	2- 75	101,603,379	164,092,262	....
Pittsburgh	76- 179	297,236,016	63,339,725	....
Elk Lick	206- 250	35,907,379	124,449,177	....
Bakerstown	275- 325	130,247,885	....	....
Upper Freeport	347- 454	417,729,945	225,759,283	....
Upper Kittanning	474- 549	597,712,896	421,298,380	26,595,994
Middle and Lower Kittanning	550- 818	1,089,153,330	1,091,996,928	193,197,312
Clarion	818A- 838	336,380,774	131,474,534	83,635,200
Upper Mercer	839- 868	568,384,820	630,609,408	165,597,696
Lower Mercer (Stockton)	869- 887A	....	95,009,587	129,467,289
Quakertown	888- 905	....	59,771,290	35,572,838
Campbell Creek (No. 2 Gas)	913- 976	....	135,042,969	294,646,810
Eagle	987-1002	....	123,780,096	283,431,347
Gilbert	1003-1016	....	....	276,888,269
Hughes Ferry	1017-1027A	....	114,524,467	436,352,717
Castle	1028-1035B	....	78,059,520	386,617,651
Sewell (Sharon)	1038-1087	11,262,874	95,344,128	810,825,840
Totals		3,585,619,298	3,554,551,754	3,112,828,963
Total for Area		....	....	10,253,000,015

The above table represents the amount of coal believed to be available in the territory of this Report. The amount already mined is practically negligible compared to the total supply and may be disregarded in the present estimate. Allowing for a total recovery of 80 per cent., the total coal that may eventually be mined is, in round numbers, 8,202,400,000 short tons.

MINABLE COALS BY MAGISTERIAL DISTRICTS.

The minable coals of these counties have been discussed by Magisterial Districts on previous pages of this Chapter. In the Index, at the end of this Report, under the heading "Minable Coals by Magisterial Districts", will be found a list of page references making this information readily available without further discussion.

TABLE OF COAL ANALYSES.

The following table, containing the proximate analyses of 129 mines and prospects, together with the ultimate analyses, calorific determinations and fuel ratios of a considerable number of these, is the exclusive work of members of the Survey Staff. All samples were taken by members of the force in the field. Those from the commercial mines were taken according to the strict method outlined by the United States Bureau of Mines, being quartered and sealed in the mines. The samples from the farm mines were collected in small bags with as much care as could be used when depending on a scanty saddle-bag equipment.

The chemical work was mostly done by J. B. Krak and Wm. Lloyd Linton, Assistant Chemists, working under the direction and with the assistance of B. H. Hite, Chief Chemist, a few of the analyses taken for publication from former volumes having been made by other staff chemists then employed by the Survey.

In addition to the analyses given in the table, numerous others are presented on the preceding pages of this Chapter along with the description of the mines from which they were taken, some of which were made by the Chemists of the Survey from samples submitted by the mine owners, while others represent samples that were taken and analyzed by the mining companies or other commercial testing organizations. Many of these are doubtless quite as accurate as those to be found in the table, but it is thought best to present them separately.

In the table the numbers in the left-hand margin correspond to the numbers given with the descriptions of the mines in the text and with the mine symbols on Maps II and IV. All samples were cut from the mining section of the seams unless otherwise described, the usual method being to discard such slates from the samples as would be discarded in ordinary commercial shipment:

Table of Coal Analyses.

No. on Maps II & IV.	Mine.	County.	Coal Bed.	Condition of Sample.	Proximate.				Common to Both.		Ultimate.				Calorimeter B. T. U. for 1 lb. of Coal.	Calculated B. T. U. for 1 lb. of Coal.	Carbon Divided by Oxygen + Ash.
					Moisture.	Volatile Matter.	Fixed Carbon.	Phosphorus.	Ash.	Sulphur.	Carbon.	Hydrogen.	Oxygen.	Nitrogen.			
3	D. G. Hudkins	B.	Redstone	A. R.	0.76	37.93	57.28	0.006	4.03	2.01	......	......	......	......	......	......	......
11	Century Coal Co. (No. 1) ("C")	B.	Redstone	A. R.	0.67	36.89	55.41	0.009	7.03	2.43	......	......	......	......	13,634	......	......
11	Century Coal Co. (No. 1) ("A")	B.	Redstone	A. R.	0.67	36.21	51.38	0.035	8.74	2.90	......	......	......	......	13,314	......	......
12	Century Coal Co. (No. 2)	B.	Redstone	A. D.	1.20	38.93	54.65	0.014	5.22	1.72	78.77	5.11	7.96	1.22	14,130	14,080	5.97
12	Century Coal Co. (No. 2)	B.	Redstone	A. R.	2.14	38.56	54.13	0.014	5.17	1.70	76.02	5.16	8.75	1.20	13,990	13,950	5.61
14	Benjamin Clevenger	B.	Redstone	A. R.	1.11	36.54	58.56	0.011	3.79	1.21	......	......	......	......	......	......	......
18A	Oda Gum	U.	Redstone	A. R.	0.67	37.81	55.15	0.018	6.37	0.87	......	......	......	......	......	......	......
21	Dudley Marple	U.	Redstone	A. R.	1.05	36.87	57.47	0.030	4.61	1.02	......	......	......	......	......	......	......
23	Opha Casto	U.	Redstone	A. R.	0.72	39.83	56.99	0.002	2.46	1.03	......	......	......	......	......	......	......
25	Abram Bennett	U.	Redstone	A. R.	0.80	39.02	54.19	0.061	5.99	2.52	......	......	......	......	......	......	......
30	Manley Post	U.	Redstone	A. R.	0.49	40.25	54.21	0.026	5.05	1.91	......	......	......	......	......	......	......
35	Arden Norman	U.	Redstone	A. R.	0.68	38.68	55.58	0.018	5.06	0.88	......	......	......	......	......	......	......
36	Claudius Marple	U.	Redstone	A. R.	1.13	38.14	52.24	0.010	8.49	2.01	......	......	......	......	......	......	......
40	S. E. Marple	U.	Redstone	A. R.	0.46	31.62	62.42	0.013	5.50	1.92	......	......	......	......	......	......	......
47	Houston Radabaugh	U.	Redstone	A. R.	0.69	42.79	49.98	0.019	6.54	3.54	......	......	......	......	......	......	......
59	Luther Martin	U.	Redstone	A. R.	1.12	37.43	51.25	0.07	10.20	3.39	......	......	......	......	......	......	......
60	Alberta Post	U.	Redstone	A. R.	0.95	37.43	49.72	0.038	11.90	1.22	......	......	......	......	......	......	......
62	G. M. Fleming	U.	Redstone	A. R.	0.96	40.43	53.08	0.014	5.53	1.81	......	......	......	......	......	......	......
67	Red Rock Fuel Co	U.	Redstone	A. D.	0.95	37.63	52.53	0.031	8.89	3.07	74.85	4.83	7.45	0.91	13,633	13,335	4.58
68	Penna. Consolidated Coal Co	U.	Redstone	A. D.	0.90	38.56	52.97	0.051	7.57	2.62	75.83	4.89	8.22	0.87	13,817	13,581	4.80
	Average	..	Redstone	A. D.	1.02	38.37	53.38	0.032	7.23	2.47	76.48	4.94	7.88	1.00	13,860	13,665	5.12
	Average	..	Redstone	A. R.	0.89	38.02	54.83	0.023	6.26	1.90	......	......	......	......	......	......	......
79	C. J. Stansberry	B.	Pittsburgh	A. R.	0.43	38.02	54.56	0.006	6.99	3.41	......	......	......	......	......	......	......
85	Calvin Boylen	B.	Pittsburgh	A. R.	0.70	37.26	53.89	0.004	8.15	3.12	......	......	......	......	......	......	......
88	Consolidation Coal Co	B.	Pittsburgh	A. D.	0.86	39.37	53.14	0.005	6.63	2.13	77.71	5.50	6.70	1.33	14,230	14,280	5.83
88	Consolidation Coal Co	B.	Pittsburgh	A. R.	1.52	39.11	52.78	0.005	6.59	2.12	77.19	5.53	7.25	1.32	14,140	14,190	5.57
89	Consolidation Coal Co	B.	Pittsburgh	A. R.	0.71	37.64	56.25	0.009	5.40	2.78	......	......	......	......	14 402	......	......
134	Amos Nutter	B.	Pittsburgh	A. R.	1.05	38.72	56.33	0.002	3.90	2.29	......	......	......	......	......	......	......
142	J. A. Wentz	B.	Pittsburgh	A. R.	0.93	37.89	55.98	0.007	5.20	2.18	......	......	......	......	......	......	......
143	Taylor Ward	B.	Pittsburgh	A. R.	0.69	40.08	50.19	0.012	9.04	3.68	......	......	......	......	......	......	......
164	D. W. Cobun	B.	Pittsburgh	A. R.	2.64	33.03	59.82	0.008	4.51	0.81	......	......	......	......	......	......	......
166	Mollie Coonts	B.	Pittsburgh	A. R.	0.80	34.28	59.50	0.004	5.42	2.54	......	......	......	......	......	......	......
167	G. M. and C. C. Right Bros	B.	Pittsburgh	A. R.	2.40	32.97	57.03	0.004	7.60	2.40	......	......	......	......	......	......	......
173	N. W. Loudin	U.	Pittsburgh	A. R.	0.85	41.37	51.23	0.007	6.55	3.08	......	......	......	......	......	......	......
	Average	..	Pittsburgh	A. R.	1.16	37.31	55.23	0.007	6.30	2.58	......	......	......	......	......	......	......
215	Newton McDaniel	B.	Elk Lick	A. R.	2.30	34.37	54.83	0.013	8.50	1.31	......	......	......	......	......	......	......
222	John Cool	U.	Elk Lick	A. R.	0.20	40.05	48.00	0.001	11.75	1.70	......	......	......	......	......	......	......
244	J. W. Heavner	U.	Elk Lick	A. R.	0.97	37.97	50.32	0.020	10.74	1.15	......	......	......	......	......	......	......
248	Martin Harper	U.	Elk Lick	A. R.	0.87	39.35	49.25	0.014	10.53	2.52	......	......	......	......	......	......	......
	Average	..	Elk Lick	A. R.	1.08	37.94	50.60	0.012	10.38	1.69	......	......	......	......	......	......	......
276	Joseph Mitchell	B.	Bakerstown	A. R.	0.80	33.93	60.87	0.0[illegible]	4.40	2.10	......	......	......	......	......	......	......
288	John Shrover	B.	Bakerstown (Cannel)	A. R.	0.45	27.35	44.78	0.005	27.42	1.25	......	......	......	......	......	......	......

Table of Coal Analyses (Continued).

No. on Maps II & IV.	Mine.	County.	Coal Bed.	Condition of Sample.	Proximate.				Common to Both.		Ultimate.				Calorimeter B. T. U. for 1 lb. of Coal.	Calculated B. T. U. for 1 lb. of Coal.	Carbon Divided by Oxygen + Ash.
					Moisture.	Volatile Matter.	Fixed Carbon.	Phosphorus.	Ash.	Sulphur.	Carbon.	Hydrogen.	Oxygen.	Nitrogen.			
286	John Shroyer	B.	Bakerstown (L. B.)	A. R.	0.87	33.83	60.99	0.005	4.31	1.58	......	......	......	......	......	......	.....
304	William J. Koontz	B.	Bakerstown	A. R.	0.58	32.02	53.50	0.011	13.90	3.57	......	......	......	......	......	......	.....
	Average	B.	Bakerstown	A. R.	0.75	33.26	58.45	0.009	7.54	2.42	......	......	......	......	......	......	.....
353	Big Run Coal Co (Volga)	B.	Upper Freeport	A. D.	1.00	35.00	54.46	0.009	9.54	4.53	73.04	4.78	7.01	1.10	13,706	13,223	4.41
353	Big Run Coal Co (Volga)	B.	Upper Freeport	A. R.	1.13	34.93	54.37	0.009	9.52	4.53	72.91	4.80	7.14	1.10	13,681	13,212	4.37
375	A. M. Nestor	B.	Upper Freeport	A. R.	0.87	30.87	58.26	0.022	10.00	2.87	......	......	......	......	......	......	.....
380	G. M. Sturm	B.	Upper Freeport	A. R.	0.90	32.15	54.05	0.01	12.90	4.20	......	......	......	......	......	......	.....
385	B. M. Stadurman	B.	Upper Freeport	A. R.	1.90	32.15	59.25	0.007	6.70	0.85	......	......	......	......	......	......	.....
398A	F. J. Booth	B.	Upper Freeport	A. R.	1.00	33.86	53.00	0.013	12.14	4.89	......	......	......	......	......	......	.....
400	Tygart Valley Mineral & Oil Co. (A. P. Lane)	B.	Upper Freeport	A. R.	0.90	31.35	51.03	0.007	16.72	5.15	......	......	......	......	......	......	.....
400A	W. H. Soden	B.	Upper Freeport	A. R.	0.60	33.33	50.24	0.01	15.83	2.06	......	......	......	......	......	......	.....
432	Buckhannon River C. & C. Co.	U.	Upper Freeport	A. D.	0.90	36.68	53.03	0.013	9.39	1.41	75.14	4.93	7.93	1.20	13,781	13,368	4.34
436	A. D. Page	U.	Upper Freeport	A. R.	0.86	41.10	51.27	0.013	6.77	1.83	......	......	......	......	......	......	.....
437	Sherman Brady	U.	Upper Freeport	A. R.	0.51	38.08	51.87	0.029	9.54	1.74	......	......	......	......	......	......	.....
	Average	..	Upper Freeport	A. D.	0.95	35.84	53.75	0.011	9.40	2.97	74.09	4.86	7.47	1.15	13,744	13,296	4.57
	Average	..	Upper Freeport	A. R.	0.97	34.20	53.71	0.018	11.12	3.14	......	......	......	......	......	......	.....
468	Isaac Moats	U.	Lower Freeport	A. R.	0.18	34.29	53.14	0.083	12.39	4.78	......	......	......	......	......	......	.....
475	Mrs. Wolf	B.	Upper Kittanning	A. R.	0.90	30.49	56.77	0.015	11.84	2.35	......	......	......	......	......	......	.....
486	Lee J. Sandridge Coal Co. (No. 5)	B.	Upper Kittanning	A. D.	0.94	31.93	55.83	0.014	11.30	4.15	73.96	4.71	4.64	1.24	13,340	13,480	4.64
486	Lee J. Sandridge Coal Co. (No. 5)	B.	Upper Kittanning	A. R.	3.18	31.21	54.56	0.014	11.05	4.06	72.29	4.85	6.54	1.21	13,040	13,180	4.11
487	A. J. Nash	B.	Upper Kittanning	A. R.	0.57	32.54	56.85	0.013	10.04	2.35	......	......	......	......	......	......	.....
493	Frank Daugherty	B.	Upper Kittanning	A. R.	0.63	34.57	55.00	0.01	9.80	1.66	......	......	......	......	......	......	.....
500	John Gable	B.	Upper Kittanning	A. R.	1.07	32.33	53.54	0.004	13.06	5.00	......	......	......	......	......	......	.....
	Average	B.	Upper Kittanning	A. R.	1.27	32.23	55.34	0.017	11.16	3.08	......	......	......	......	......	......	.....
555	Midland Coal & Coke Co.	B.	Lower Kittanning	A. D.	1.20	30.50	56.45	0.021	11.85	3.57	70.72	4.50	8.25	1.05	13,166	12,618	3.52
555	Midland Coal & Coke Co.	B.	Lower Kittanning	A. R.	2.11	30.23	55.92	0.021	11.74	3.54	70.07	4.66	8.95	1.04	13,045	12,530	3.35
571	Laurel Coal Co.	B.	Lower Kittanning	A. R.	0.62	31.35	59.58	0.006	8.45	2.60	......	......	......	......	13,863	......	.....
572	Boat Run Coal Co.	B.	Lower Kittanning	A. R.	0.66	30.78	55.29	0.010	13.17	2.52	......	......	......	......	13,474	......	.....
573	Luella Coal & Coke Co.	B.	Lower Kittanning	A. D.	1.00	32.86	58.24	0.010	7.90	1.39	78.81	5.09	5.43	1.38	14,100	14,250	5.91
573	Luella Coal & Coke Co.	B.	Lower Kittanning	A. R.	1.89	32.58	57.70	0.010	7.83	1.37	78.11	5.15	6.18	1.36	13,980	14,120	5.37
574	Lee J. Sandridge Coal Co. (No. 1)	B.	Lower Kittanning	A. D.	0.73	32.05	58.00	0.031	9.22	1.70	77.66	4.87	5.18	1.42	13,840	13,980	5.41
574	Lee J. Sandridge Coal Co. (No. 1)	B.	Lower Kittanning	A. R.	3.58	31.13	56.33	0.031	8.96	1.65	75.42	5.05	7.55	1.37	13,460	13,580	4.3
574	Lee J. Sandridge Coal Co. (No. 1)	B.	Lower Kittanning	A. R.	0.53	29.44	62.92	0.024	7.11	2.51	......	......	......	......	13,896	......	.....
582	Humphreys Coal Co.	B.	Lower Kittanning	A. D.	0.91	32.69	57.49	0.009	8.91	1.62	77.30	5.01	5.74	1.42	13,800	13,970	5.27
582	Humphreys Coal Co.	B.	Lower Kittanning	A. R.	3.87	31.71	55.78	0.009	8.64	1.57	74.99	5.10	8.23	1.38	13,480	13,560	4.44
588	Grafton Fuel Co.	B.	Lower Kittanning	A. D.	0.94	34.62	54.32	0.032	10.12	1.28	76.44	4.74	6.18	1.24	13,600	13,630	4.69
588	Grafton Fuel Co.	B.	Lower Kittanning	A. R.	2.46	34.09	53.48	0.032	9.97	1.26	75.27	4.84	7.44	1.22	13,390	13,420	4.22
597	J. F. Wilson & Bro	B.	Lower Kittanning	A. R.	0.82	30.55	58.03	0.005	10.00	2.25	......	......	......	......	......	......	.....
604	Davis C. & C. Co. (Dartmoor No. 4)	B.	Middle and Lower Kittanning	A. D.	0.81	30.51	58.70	0.003	9.98	1.04	77.00	4.79	5.82	1.37	13,640	13,750	4.87
604	Davis C. & C. Co. (Dartmoor No. 4)	B.	Middle and Lower Kittanning	A. R.	4.02	29.25	56.26	0.003	9.57	1.00	73.82	5.06	9.24	1.32	13,070	13,180	3.92
605	Davis Colliery Co. (Junior No. 4)	B.	Lower Kittanning	A. R.	0.81	28.73	61.98	0.01	8.48	1.07	......	......	......	......	14,080	......	.....
606	Gage Coal & Coke Co. (Sarah)	B.	Lower Kittanning	A. D.	1.06	29.26	59.10	0.032	10.58	1.60	74.77	4.50	7.38	1.16	13,780	13,193	4.10

Table of Coal Analyses (Continued).

No. on Maps II & IV	Mine.	County.	Coal Bed.	Condition of Sample.	Proximate.				Common to Both.		Ultimate.				Calorimeter B. T. U. for 1 lb. of Coal.	Calculated B. T. U. for 1 lb. of Coal.	Carbon Divided by Oxygen + Ash.
					Moisture.	Volatile Matter.	Fixed Carbon.	Phosphorus.	Ash.	Sulphur.	Carbon.	Hydrogen.	Oxygen.	Nitrogen.			
606	Gage Coal & Coke Co. (Sarah)	B.	Lower Kittanning	A. R.	1.78	29.05	58.66	0.032	0.51	1.54	74.24	4.64	7.92	1.15	13,642	13,111	4.03
609	Davis C. & C. Co. (No. 5)	B.	Lower Kittanning	A. D.	0.63	30.87	57.93	0.007	10.57	1.61	76.49	4.51	5.47	1.35	13,520	13,560	4.77
609	Davis C. & C. Co. (No. 5)	B.	Lower Kittanning	A. R.	1.81	30.50	57.25	0.007	10.44	1.59	75.58	4.59	6.47	1.33	13,360	13,400	4.47
612	M. N. O'Brien	B.	Lower Kittanning	A. R.	0.61	32.96	53.66	0.018	12.77	1.85	......	......	......	......	......	......	.....
614	Valley Coal & Coke Co.	B.	Lower Kittanning	A. R.	0.60	29.38	54.40	0.06	15.62	3.20	......	......	......	......	......	......	.....
621	Columbus Shomoe	B.	Lower Kittanning	A. R.	1.10	30.33	49.87	0.005	18.70	3.97	......	......	......	......	......	......	.....
622	Peter Devitt	B.	Lower Kittanning	A. R.	0.54	29.96	54.79	0.013	14.71	1.58	......	......	......	......	......	......	.....
623	Henry George	B.	Lower Kittanning	A. R.	0.99	31.89	62.77	0.002	4.35	0.65	......	......	......	......	......	......	.....
659A	D. C. Dunnington	U.	Middle Kittanning	A. R.	0.67	33.86	51.53	0.004	13.94	0.67	......	......	......	......	......	......	.....
660	Okey Harris	U.	Middle Kittanning	A. R.	0.54	35.96	53.54	0.003	9.96	3.96	......	......	......	......	......	......	.....
673	John Allman	U.	Lower Kittanning	A. R.	0.69	36.27	48.98	0.007	14.06	1.04	......	......	......	......	......	......	.....
683	Howard Rowan	U.	Lower Kittanning	A. R.	0.16	35.87	52.02	0.003	11.95	1.36	......	......	......	......	......	......	.....
687	Imperial Sand Co.	U.	Lower Kittanning	A. R.	0.85	35.80	52.25	0.011	11.10	1.29	......	......	......	......	......	......	.....
694	Jesse Pringle	U.	Lower Kittanning	A. R.	0.72	33.89	51.93	0.005	13.46	3.04	......	......	......	......	......	......	.....
728	John Cutright	U.	Lower Kittanning	A. R.	0.64	34.98	53.73	0.034	10.65	1.62	......	......	......	......	......	......	.....
743	Emanuel Goodwin	U.	Middle Kittanning	A. R.	0.81	34.79	58.96	0.032	5.44	0.82	......	......	......	......	......	......	.....
759	George Fidler	U.	Middle Kittanning	A. R.	0.41	38.02	48.67	0.059	12.87	4.01	......	......	......	......	......	......	.....
770	Moore Bros.	U.	Lower Kittanning	A. R.	0.50	34.25	51.40	0.049	13.85	2.75	......	......	......	......	......	......	.....
772	Moore & Gawthrop	U.	Lower Kittanning	A. R.	0.67	37.24	50.82	0.007	11.27	1.20	......	......	......	......	......	......	.....
787	Davis C. & C. Co. (Weaver No. 2)	R.	Middle and Lower Kittanning	A. R.	0.62	29.81	58.29	0.031	11.28	1.63	......	......	......	......	13,785	......	.....
788	Davis C. & C. Co. (Williette)	R.	Middle and Lower Kittanning	A. D.	0.79	31.56	56.59	0.059	11.06	1.25	76.68	4.46	5.31	1.24	13,510	13,550	4.68
788	Davis C. & C. Co. (Williette)	R.	Middle and Lower Kittanning	A. R.	2.30	31.08	55.73	0.059	10.89	1.23	75.52	4.56	6.58	1.22	13,300	13,340	4.22
791	Davis Colliery Co. (Harding No. 4)	R.	Middle and Lower Kittanning	A. D.	0.69	30.84	57.97	0.028	10.50	1.94	76.47	4.78	5.11	1.20	13,690	13,760	4.90
791	Davis Colliery Co. (Harding No. 4)	R.	Middle and Lower Kittanning	A. R.	2.28	30.35	57.04	0.028	10.33	1.91	75.24	4.68	6.46	1.18	13,470	13,540	4.48
801	Davis Colliery Co. (Sivad No. 5B)	R.	Middle and Lower Kittanning	A. D.	0.85	32.76	56.68	0.018	9.71	1.62	76.19	4.93	6.81	1.24	13,760	13,710	4.75
801	Davis Colliery Co. (Sivad No. 5B)	R.	Middle and Lower Kittanning	A. R.	2.88	32.09	55.52	0.018	9.51	1.59	74.63	5.05	8.01	1.21	13,460	13,430	4.26
804	Davis Colliery Co. (Sivad No. 2)	R.	Middle and Lower Kittanning	A. D.	1.01	30.76	58.90	0.010	9.33	1.62	76.71	4.95	6.10	1.29	13,700	13,820	4.97
804	Davis Colliery Co. (Sivad No. 2)	R.	Middle and Lower Kittanning	A. R.	3.29	30.05	57.55	0.010	9.11	1.58	74.94	5.10	8.02	1.25	13,390	13,500	4.27
807	Davis Colliery Co. (Coalton No. 1)	R.	Middle and Lower Kittanning	A. D.	1.11	30.42	57.21	0.051	11.26	2.05	75.12	4.78	5.55	1.24	13,370	13,540	4.47
807	Davis Colliery Co. (Coalton No. 1)	R.	Middle and Lower Kittanning	A. R.	2.47	30.01	56.41	0.051	11.11	2.02	74.09	4.87	6.69	1.22	13,190	13,350	4.16
810	A. Spates Brady	R.	Middle and Lower Kittanning	A. D.	0.92	31.17	60.82	0.018	7.09	0.95	79.12	5.23	6.27	1.34	14,270	14,300	5.92
810	A. Spates Brady	R.	Middle and Lower Kittanning	A. R.	2.50	30.68	59.84	0.018	6.98	0.93	77.86	5.32	7.59	1.32	14,040	14,080	5.34
811	J. B. Jenkins C. & C. Co.	R.	Middle and Lower Kittanning	A. D.	0.99	30.61	59.65	0.049	8.75	1.18	77.24	5.06	6.34	1.48	13,820	13,930	5.12
811	J. B. Jenkins C. & C. Co.	R.	Middle and Lower Kittanning	A. R.	2.36	30.19	58.82	0.049	8.63	1.12	76.18	5.14	7.46	1.47	13,630	13 740	4.73
	Average	..	Middle and Lower Kittanning	A. D.	0.91	31.43	57.87	0.025	9.79	1.62	76.45	4.82	6.02	1.30	13,707	13,704	4.89
	Average	..	Middle and Lower Kittanning	A. R.	1.49	32.14	55.63	0.021	10.74	1.88	75.06	4.94	7.52	1.27	13,551	13,459	4.40
821	H. M. Crawford & Co.	B.	Clarion	A. D.	0.85	32.27	54.86	0.009	12.02	1.80	73.58	4.44	7.07	1.09	13,400	12,985	3.85
821	H. M. Crawford & Co.	B.	Clarion	A. R.	1.29	32.13	54.61	0.009	11.97	1.80	73.26	4.49	7.39	1.00	13,341	12,944	3.75
823	H. M. Crawford & Co.	B.	Clarion	A. R.	0.68	32.58	58.77	0.008	7.97	3.57	......	......	......	......	......	......	.....
834	Davis Coal & Coke Co. (Leiter)	R.	Clarion	A. R.	0.54	30.82	60.20	0.025	8.44	1.86	......	......	......	......	13,966	......	.....
	Average	..	Clarion	A. R.	0.84	31.84	57.86	0.014	9.46	2.41	......	......	......	......	13,654	......	.....
843	Charles E. Hiner	U.	Upper Mercer	A. R.	0.49	34.49	57.04	0.006	7.98	1.31	......	......	......	......	......	......	.....

No. on Maps II & IV.	Mine.	County.	Coal Bed.	Condition of Sample.	PROXIMATE.				COMMON TO BOTH.		ULTIMATE.				Calorimeter B. T. U. for 1 lb. of Coal.	Calculated B. T. U. for 1 lb. of Coal.	Carbon Divided by Oxygen + Ash.
					Moisture.	Volatile Matter.	Fixed Carbon.	Phosphorus.	Ash.	Sulphur.	Carbon.	Hydrogen.	Oxygen.	Nitrogen.			
855	John McKissic	U.	Upper Mercer	A. R.	0.31	38.66	56.28	0.002	4.75	1.11	.....	.....	.....	.....	.....	.....	.....
861	Maxwell, Arnold et al.	R.	Upper Mercer	A. R.	0.77	31.93	58.40	0.005	8.90	2.02	.....	.....	.....	.....	.....	.....	.....
861A	Moore-Keppel & Co.	R.	Upper Mercer	A. R.	0.60	32.52	58.09	0.007	8.79	2.02	.....	.....	.....	.....	.....	.....	.....
	Average	..	Upper Mercer	A. R.	0.54	34.40	57.45	0.005	7.61	1.61	.....	.....	.....	.....	.....	.....	.....
871	Silica Sand Co.	U.	Lower Mercer (Stockton)	A. R.	2.25	37.30	53.24	0.003	7.21	0.69	.....	.....	.....	.....	.....	.....	.....
878	John Thomas	U.	Lower Mercer (Stockton)	A. R.	0.60	34.31	53.09	0.003	12.00	0.66	.....	.....	.....	.....	.....	.....	.....
887	Andrew Balli	R.	Lower Mercer (Stockton)	A. R.	0.91	34.27	53.17	0.007	11.65	0.73	.....	.....	.....	.....	.....	.....	.....
	Average	..	Lower Mercer (Stockton)	A. R.	1.25	35.29	53.17	0.004	10.29	0.69	.....	.....	.....	.....	.....	.....	.....
899	H. A. Zickefoose	U.	Quakertown	A. R.	0.84	34.73	58.32	0.004	6.11	1.66	.....	.....	.....	.....	.....	.....	.....
919	Moore-Keppel & Co.	U.	Campbell Creek (No. 2 Gas)	A. R.	0.80	31.60	56.30	0.006	11.30	0.73	.....	.....	.....	.....	.....	.....	.....
925	Patrick Martin	U.	Campbell Creek (No. 2 Gas)	A. R.	1.70	32.37	54.46	0.014	11.47	0.71	.....	.....	.....	.....	.....	.....	.....
930	James Crawford	U.	Campbell Creek (No. 2 Gas)	A. R.	0.76	36.29	50.60	0.004	12.35	1.50	.....	.....	.....	.....	.....	.....	.....
944	William Hornbeck	R.	Campbell Creek (No. 2 Gas)	A. R.	0.80	31.33	65.93	0.006	1.94	0.76	.....	.....	.....	.....	.....	.....	.....
947	John Fincham	R.	Campbell Creek (No. 2 Gas)	A. R.	0.55	30.55	67.14	0.001	1.76	0.92	.....	.....	.....	.....	.....	.....	.....
951	Ella Brake	R.	Campbell Creek (No. 2 Gas)	A. R.	0.92	33.42	59.30	0.003	6.36	1.37	.....	.....	.....	.....	.....	.....	.....
962	James Pickens	R.	Campbell Creek (No. 2 Gas)	A. R.	0.80	33.70	59.92	0.004	5.58	0.74	.....	.....	.....	.....	.....	.....	.....
972	Casper Winkler	R.	Campbell Creek (No. 2 Gas)	A. R.	1.32	33.88	63.02	0.004	1.78	0.69	.....	.....	.....	.....	.....	.....	.....
	Average	..	Campbell Creek (No. 2 Gas)	A. R.	0.96	32.89	59.58	0.005	6.57	0.93	.....	.....	.....	.....	.....	.....	.....
990	Lloyd Zickefoose	R.	Eagle	A. R.	1.60	30.20	62.80	0.003	5.40	1.84	.....	.....	.....	.....	.....	.....	.....
990A	Stephen Womelsdorff	R.	Eagle	A. R.	1.00	28.20	63.10	0.003	7.70	1.47	.....	.....	.....	.....	.....	.....	.....
993	James Sherman	R.	Eagle	A. R.	2.30	32.50	60.94	0.002	4.26	0.67	.....	.....	.....	.....	.....	.....	.....
1002	John Gimmel	R.	Eagle	A. R.	0.92	32.77	61.17	0.001	5.14	0.74	.....	.....	.....	.....	.....	.....	.....
	Average	R.	Eagle	A. R.	1.46	30.92	62.00	0.002	5.62	1.18	.....	.....	.....	.....	.....	.....	.....
1023	Joseph Currence	R.	Hughes Ferry	A. R.	0.83	31.23	57.94	0.010	10.00	1.70	.....	.....	.....	.....	.....	.....	.....
1025	Elkhorn Coal Corporation	R.	Hughes Ferry	A. R.	0.71	31.32	66.65	0.001	1.32	0.67	.....	.....	.....	.....	.....	.....	.....
	Average	R.	Hughes Ferry	A. R.	0.77	31.28	62.29	0.005	5.66	1.19	.....	.....	.....	.....	.....	.....	.....
1036	Elkhorn Coal Corporation	R.	Sewell "B"	A. R.	0.65	31.25	66.20	0.002	1.90	0.69	.....	.....	.....	.....	.....	.....	.....
1044	Grace Hart Johnson	R.	Sewell	A. R.	1.26	30.99	63.07	0.05	4.68	0.59	.....	.....	.....	.....	.....	.....	.....
1051	Ira Shockey	R.	Sewell	A. R.	1.00	30.00	63.94	0.027	5.06	0.65	.....	.....	.....	.....	.....	.....	.....
1052	J. A. Enlow	R.	Sewell	A. R.	0.91	30.46	64.23	0.019	4.40	2.23	.....	.....	.....	.....	.....	.....	.....
1055	Moore-Keppel & Co.	R.	Sewell	A. R.	1.26	27.54	57.44	0.009	13.76	0.48	.....	.....	.....	.....	.....	.....	.....
1057	R. O. Zirkle	R.	Sewell	A. R.	1.00	28.80	60.87	0.005	9.33	0.52	.....	.....	.....	.....	.....	.....	.....
1060	William Currence	R.	Sewell	A. R.	0.95	30.80	61.17	0.019	7.08	0.63	.....	.....	.....	.....	.....	.....	.....
1063	Henry Moats	R.	Sewell	A. R.	0.87	31.12	54.38	0.008	13.63	0.85	.....	.....	.....	.....	.....	.....	.....
1064	Arthur Shiflett	R.	Sewell	A. R.	0.72	30.18	63.95	0.043	5.15	0.66	.....	.....	.....	.....	.....	.....	.....
1065	Emil Metzner	R.	Sewell	A. R.	0.63	32.95	61.20	0.005	5.22	1.46	.....	.....	.....	.....	.....	.....	.....
1068	Elkhorn Coal Corporation (Beech Camp)	R.	Sewell	A. R.	0.53	32.95	62.62	0.002	3.90	0.66	.....	.....	.....	.....	.....	.....	.....
1072	Ranwood Lumber Co.	W.	Sewell	A. R.	0.67	29.56	65.35	0.008	4.42	0.56	.....	.....	.....	.....	.....	.....	.....
1076	H. G. Davis Heirs	R.	Sewell	A. R.	0.40	26.00	61.22	0.015	12.38	0.55	77.76	4.24	3.95	1.12	13,615	13,531	4.76
1078	Croft Lumber Co.	R.	Sewell	A. R.	0.66	30.13	61.78	0.019	7.48	0.98	.....	.....	.....	.....	.....	.....	.....
1081	William Vandevender	R.	Sewell	A. R.	0.84	30.79	64.73	0.002	3.64	1.25	.....	.....	.....	.....	.....	.....	.....
1086	Hale & Kenney	R.	Sewell	A. R.	2.36	33.04	61.13	0.003	3.47	0.71	.....	.....	.....	.....	.....	.....	.....
	Average	..	Sewell	A. R.	0.94	30.35	61.80	0.015	6.91	0.85	.....	.....	.....	.....	.....	.....	.....

Page References to Detailed Descriptions and Sections of Coal Mines Listed in Preceding Table.

No. on Map.	Sample No.	*Coal Bed* and Name of Owner.	Location.	Page.
		Redstone.		
3	223-T	D. G. Hudkins	2.3 mi. E. of Overfield	444
11	II, p. 161	Century Coal Co. (No. 1)	At Century	446
12	6-T	Century Coal Co. (No. 2)	1.5 mi. E. of Century	447
14	205-T	Benjamin Clevenger	1.5 mi. N. W. of Volga	447
18A	203-T	Oda Gum	1.5 mi. S. W. of Century	122, 448
21	110-R	Dudley Marple	0.2 mi. E. of Pecks Run Sta.	448
23	202-T	Opha Casto	At Pecks Run	449
25	201-T	Abram Bennett	1.2 mi. S. W. of Pecks Run	449
30	204-T	Manley Post	1 mi. N. W. of Ruraldale	450
35	108-R	Arden Norman	1.7 mi. S. E. of Johnstown	451
36	164-R	Claudius Marple	1.8 mi. S. W. of Ruraldale.	451
40	116-R	S. E. Marple	1.5 mi. N. E. of Aberdeen	451
47	107-R	Houston Radabaugh	2.1 mi. S. W. of Ruraldale.	453
59	218-T	Luther Martin	1.9 mi. N. of Buckhannon.	454
60	217-T	Alberta Post	1.2 mi. N. of Buckhannon.	126, 455
62	106-R	G. M. Fleming	1.7 mi. N. W. of Buckhannon	455
67	B2, p. 312	Red Rock Fuel Co	0.8 mi. N. of Red Rock Sta.	456
68	IIA, p. 667	Penna. Cons. Coal Co	0.3 mi. E. of Lorentz	457
		Pittsburgh.		
79	227-T	C. J. Stansberry	2.5 mi. N. W. of Berryburg	461
85	228-T	Calvin Boylen	1.2 mi. N. W. of Berryburg	462
88	1-T	Consolidation Coal Co	At Berryburg	463
89	II, p. 206	Consolidation Coal Co	At Berryburg	83, 463
134	221-T	Amos Nutter	2.5 mi. N. W. of Elk City.	469
142	220-T	J. A. Wentz	1.1 mi. N. W. of Elk City.	470
143	225-T	Taylor Ward	0.6 mi. N. W. of Peeltree.	471
164	136-R	D. W. Cobun	1 mi. S. W. of Colebank	474
166	148-R	Mollie Coonts	1.2 mi. W. of Huffman	475
167	147-R	G. M. & C. C. Right Bros	2.2 mi. N. of Belington	475
173	219-T	N. W. Loudin	1.8 mi. S. W. of Pecks Run	476
		Elk Lick.		
215	135-R	Newton McDaniel	1 mi. S. of Colebank	482
222	206-T	John Cool	0.9 mi. S. of Teter	484
244	105-R	J. W. Heavner	1 mi. N. E. of Buckhannon	488
248	207-T	Martin Harper	0.8 mi. N. W. of Reger	489
		Bakerstown.		
276	229-T	Joseph Mitchell	1.4 mi. S. W. of Moatsville	492
286	133-R	John Shroyer	1.8 mi. N. E. of Cove Run Sta.	494
286	134-R	John Shroyer	1.8 mi. N. E. of Cove Run Sta.	494
304	143-R	William J. Koontz	1.6 mi. W. of Huffman	497
		Upper Freeport.		
353	IIA, p. 528	Big Run Coal Co	0.6 mi. S. E. of Volga	507
375	137-R	A. M. Nestor	At Nestorville	513
380	138-R	G. M. Sturm	1.1 mi N. W. of Vannoys Mill	514
385	144-R	B. M. Stadurman	1.7 mi. N. of Calhoun	515
398A	150-R	F. J. Booth	1.3 mi. S. E. of Belington.	518
400	233-T	Tygart Valley M. & O. Co. (A. P. Lane mine)	1 mi. W. of Belington	519
400A	234-T	W. H. Soden	0.4 mi. S. W. of Werner	519
432	IIA, p. 528	Buckhannon R. C. & C. Co. (Adrian mine)	0.7 mi. N. W. of Adrian	525
436	109-R	A. D. Page	1 mi. N. E. of French Creek	526
437	114-R	Sherman Brady	0.8 mi. E. of French Creek	526
		Lower Freeport.		
468	210-T	Isaac Moats	At Swamp Run	247

No. on Map.	Sample No.	*Coal Bed* and Name of Owner.	Location.	Page.
		Upper Kittanning.		
475	231-T	Mrs. Wolf	0.4 mi. N. W. of Felton	532
486	3-T	Lee J. Sandridge Coal Co. (Meriden No. 5)	At Meriden	534-5
487	141-R	A. J. Nash	Western edge of Philippi	535
493	232-T	Frank Daugherty	1.7 mi. E. of Lillian	537
500	132-R	John Gable	1.1 mi. S. of Moatsville	539
		Middle and Lower Kittanning.		
555	IIA, p. 528	Midland Coal & Coke Co	0.6 mi. N. E. of Berryburg Jct.	84, 554-5
571	IIA, p. 506	Laurel Coal Co	0.6 mi. N. E. of Arden	559
572	IIA, p. 507	Boat Run Coal Co	At Arden	96, 559-60
573	4-T	Luella Coal & Coke Co	0.5 mi. S. of Arden	560
574	2-T	Lee J. Sandridge Coal Co. No. 1)	At Meriden	561
574	IIA, p. 507	Lee J. Sandridge Coal Co. (No. 1)	At Meriden	561
582	5-T	Humphreys Coal Co	0.8 mi. S. of Philippi	562
583	7-T	Graften Fuel Co	0.5 mi. N. of Lillian	563-4
597	139-R	J. F. Wilson & Bro	1.9 mi. S. E. of Valley Furnace	568
604	8-T	Davis Coal & Coke Co. (Dartmoor No. 4)	0.7 mi. S. of Dartmoor	570
605	IIA, p. 510	Davis Colliery Co. (Junior No. 4)	0.4 mi. N. E. of Junior	571-2
606	IIA, p. 517	Gage Coal & Coke Co. (Sarah)	At Gage	161, 572-3
609	10-T	Davis Coal & Coke Co. (No. 5)	0.2 mi. N. E. of Tigheview	574
612	235-T	M. N. O'Brien	At O'Brien	114, 575
614	IIA, p. 509	Valley Coal & Coke Co	At Wilmoth Ford	111, 575-6
621	236-T	Columbus Shomoe	0.6 mi. E. of Talbott	578
622	239-T	Peter Devitt	0.6 mi. E. of Talbott	578
623	237-T	Henry George	1.8 mi. N. E. of Lantz	578
659A	238-T	D. C. Cunningham	0.9 mi. N. E. of Lantz	132, 588
660	211-T	Okey Harris	1.2 mi. N. W. of Yokum	589
673	120-R	John Allman	0.6 mi. S. of Evergreen	592
683	208-T	Howard Rowan	1.2 mi. N. W. of Tenmile	595
687	209-T	Imperial Sand Co	At Imperial	137, 596
694	113-R	Jesse Pringle	0.5 mi. N. W. of Alexander	138, 598
728	214-T	John Cutright	1.6 mi. N. E. of Beans Mill	607
743	213-T	Emanuel Goodwin	1.1 mi. N. W. of Queen	611
759	117-R	George Fidler	At Arlington	616
770	119-R	Moore Bros	0.8 mi. W. of Holly Grove	619
772	121-R	Moore & Gawthrop	0.9 mi. S. E. of Holly Grove	619
787	IIA, p. 512	Davis Coal & Coke Co. (Weaver No. 2)	At Weaver	624
788	9-T	Davis Coal & Coke Co. (Williette)	0.5 mi. N. E. of Weaver	625
791	11-T	Davis Colliery Co. (Harding No. 4)	0.9 mi. N. E. of Harding	626
801	15-T	Davis Colliery Co. (Sivad No. 5B)	0.8 mi. S. W. of Harding	630
804	14-T	Davis Colliery Co. (Sivad No. 2)	0.7 mi. S. of Roaring Creek Jct.	631
807	13-T	Davis Colliery Co. (Coalton No. 1, No. 3 Opg.)	At Coalton	633
810	17-T	A. Spates Brady	0.7 mi. N. E. of Mabie	635-6
811	16-T	J. B. Jenkins C. & C. Co	0.3 mi. S. of Mabie	636-7
		Clarion.		
821	IIA, p. 528	H. M. Crawford & Co	At Adma Station	100, 642-3
823	230-T	H. M. Crawford & Co	At Clements	110, 644
834	B. 2, p. 300	Davis Coal & Coke Co. (Leiter)	0.3 mi. S. of Leiter	165, 647
		Upper Mercer.		
843	212-T	Charles E. Hiner	0.7 mi. S. E. of Overhill	652
855	118-R	John McKissic	0.6 mi. N. of Kanawha Head	656
861	239-T	Maxwell, Arnold et al	2.8 mi. N. E. of Cassity	658
861A	241-T	Moore-Keppel & Co	1.2 mi. S. E. of Cassity	659
		Lower Mercer (Stockton).		
871	122-R	Silica Sand Co	0.4 mi. W. of Craddock	662
878	123-R	John Thomas	1 mi. S. E. of Canaan	665
887	159-R	Andrew Balli	1.8 mi. S. W. of Silica	668
		Quakertown.		
899	215-T	H. A. Zickefoose	West edge of Hemlock	146, 672
		Campbell Creek (No. 2 Gas).		
919	248-T	Moore-Keppel & Co	0.5 mi. S. of Ellamore	678
925	125-R	Patrick Martin	1.7 mi. S. E. of Queen	679
930	216-T	James Crawford	1.4 mi. S. E. of Alexander	680

No. on Map.	Sample No.	*Coal Bed* and Name of Owner.	
944	248-T	William Hornbeck....................	2.2 mi. S.
947	244-T	John Fincham........................	1.6 mi. N.
951	155-R	Ella Brake...........................	0.9 mi. N.
962	253-T	James Pickens.......................	0.3 mi. S.
972	160-R	Casper Winkler......................	1 mi. W. o
		Eagle.	
990	156-R	Lloyd Zickefoose....................	0.2 mi. E.
990A	153-R	Stephen Womelsdorff.................	1 mi. S. I
998	154-R	James Shannon......................	1.8 mi. S.
1002	254-T	John Gimmel.........................	0.7 mi. S.
		Hughes Ferry.	
1023	242-T	Joseph Currence.....................	3 mi. N. I
1025	251-T	Elkhorn Coal Corpn..................	At Hartrid
		Sewell "B".	
1036	250-T	Elkhorn Coal Corpn..................	1.1 mi. S.
		Sewell.	
1044	152-R	Grace Hart Johnson..................	3.2 mi. S. l
1051	247-T	Ira Shockey.........................	At Long..
1052	246-T	J. A. Enlow.........................	0.4 mi. N. o
1055	158-R	Moore-Keppel & Co..................	0.8 mi. N.
1057	157-R	R. O. Zirkle.........................	0.5 mi. N.
1060	240-T	William Currence....................	4.7 mi. S.
1063	245-T	Henry Moats.........................	3.2 mi. N.
1064	243-T	Arthur Shiflett........................	2.1 mi. N.
1065	252-T	Emil Metzner........................	1.7 mi. S. I
1068	249-T	Elkhorn Coal Corpn. (Beech Camp)....	1.6 mi. S. o
1072	213-R	Ranwood Lumber Co..................	5 mi. S. of
1076	IIA, p. 239	H. G. Davis Heirs...................	2.7 mi. W.
1078	232-R	Croft Lumber Co.....................	1.8 mi. S..of
1081	161-R	William Vandevender.................	2.5 mi. N. W
1086	163-R	Hale & Kenney......................	2.4 mi. N. W

CHAPTER XII.

ROAD MATERIALS.

The territory covered by the counties of Barbour, Upshur, and the western portion of Randolph, embraced in this Report, can provide an abundance of all the raw materials needed for the economical building and maintenance of improved highways. It is true that the factories for the conversion of many of these materials into the forms desired (cement, brick, etc.) are not in operation, but many of these will come in time, and for the present some of the less highly specialized classes of road material can be used with good results, thus making it possible for the roads to be improved without the foreign expenditure of a single dollar either for material or labor. Many of these materials have been already described under various headings in the foregoing pages, to which reference will be made.

STRATIFIED SHALES SUITABLE FOR PAVING BRICK MANUFACTURE.

Nearly all of the various geological series that compose the outcropping formations of the three counties contain a large proportion of stratified red or gray shales, several of which have been used for making paving brick.and many more of which by their native mixture of siliceous and aluminous matter could be used. It is perhaps true that some of these would not show the maximum qualities of endurance demanded for ideal road brick but the very great saving resulting from the use of home material would in many cases make it more economical to use them even if their durability should not prove to be so great.

Google

The following table gives a list of these stratified shales that could be used, together with their approximate thicknesses. In the last column there is given a page reference to that portion of this Report in which each one has been described in detail. Geologic Maps II and IV show the outcrops of the various series making it possible to readily know what shales are to be found in any given community:

Table of Stratified Shales Suitable for Paving Brick Manufacture.

Name of Shale	Geological Series	Approximate Thickness. Feet.	Page on which Described
Annabelle	Monongahela	5 to 50	191
Clarksburg Fire Clay Shale	Conemaugh	2 to 6	209-210
Clarksburg Red Shale	Conemaugh	25 to 50	214
Birmingham	Conemaugh	5 to 10	218-219
Pittsburgh	Conemaugh	25 to 50	227
Thornton	Conemaugh	0 to 5	239-240
Bolivar	Allegheny	2 to 10	243
Upper Kittanning	Allegheny	0 to 5	252-2
Hardman	Allegheny	0 to 5	255
Lower Kittanning	Allegheny	0 to 10	261
Mt. Savage? or Hammond?	Pottsville	0 to 10	See Chapter XIII
Quakertown	Pottsville	0 to 10	273-4
Newlon	Pottsville	0 to 20	281
Mauch Chunk Red Shales	Mauch Chunk	300 to 1200 (Interstratified with sandstones)	294-6

SANDSTONES AVAILABLE FOR MASONRY AND MACADAM.

Numerous sandstones are available for bridge piers and abutments, retaining walls and other structures where massive masonry is desired. Most of these ledges would prove too soft, however, to warrant their extensive use as macadam. only a few isolated quarries providing crushed stone hard enough for this kind of road material. The following table gives a list of the principal sandstone horizons that would prove suitable for quarrying, those printed in full-faced type having already been used in masonry construction:

Table of Sandstones Available for Masonry Construction.

Name of Sandstone	Geological Series	Approximate Thickness. Feet.	Page on which Described.
Upper Sewickley	Monongahela	20 to 50	194
Lower Sewickley	Monongahela	10 to 30	195
Lower Pittsburgh	Conemaugh	20 to 40	203-4
Connellsville	Conemaugh	20 to 50	205
Lower Connellsville	Conemaugh	20 to 40	212-13
Morgantown	Conemaugh	15 to 30	215
Grafton	Conemaugh	10 to 30	219-221
Saltsburg	Conemaugh	10 to 30	227-9
Buffalo	Conemaugh	20 to 50	230-2
Upper Mahoning	Conemaugh	10 to 30	238-9
Lower Mahoning	Conemaugh	15 to 35	238-9
Upper Freeport	Allegheny	20 to 35	244-5
Lower Freeport	Allegheny	20 to 40	249-51
East Lynn	Allegheny	20 to 40	255-60
Homewood	Pottsville	25 to 60	267-9
Upper Connoquenessing	Pottsville	30 to 65	271-3
Lower Connoquenessing (Lower Winifrede?)	Pottsville	30 to 60	274-5
Upper Cedar Grove	Pottsville	0 to 25	275
Lower Cedar Grove	Pottsville	10 to 50	276
Monitor	Pottsville	0 to 20	278
Brownstown	Pottsville	10 to 50	279
Eagle	Pottsville	20 to 50	280
Decota	Pottsville	10 to 20	282
Upper Gilbert	Pottsville	20 to 30	283
Upper Nuttall	Pottsville	10 to 20	284-5
Lower Nuttall	Pottsville	20 to 40	285
Middle Iaeger	Pottsville	15 to 25	286
Harvey	Pottsville	20 to 40	286
Guyandot	Pottsville	25 to 50	287
Lower Guyandot	Pottsville	10 to 20	288
Welch	Pottsville	10 to 30	291
Sharon (Upper Raleigh)	Pottsville	25 to 75	292-3

Of the above list of sandstones those of the Pottsville have been quarried but little, not because of any inherent deficiencies but mainly because they crop in a region that is largely wooded and where few masonry structures have been built and for the same reasons their description is somewhat limited in this Report. Those of the Monongahela, Conemaugh, and Allegheny, which crop in much more thickly settled regions, have been described in great detail.

LIMESTONE FOR MACADAM.

In the Monongahela, Conemaugh, and Allegheny Series, several ledges of limestone suitable for macadam are found, all of which are described in detail on the previous pages. The Pottsville and Mauch Chunk contain no limestones of consequence, but the great Greenbrier Limestone, varying in thickness from 50 to 400 feet, is unsurpassed in durability and general adaptability for road material. It crops along Brushy Fork of Teter Creek just east of the Barbour Line, and along Mill Run of Teter Creek, Barbour, and along the Tygart Valley River in Randolph County where that stream cuts through the Laurel Ridge east of Roaring Creek Junction, and also along Elk River in Randolph County. Great deposits of it are available all along the east slope of Laurel Ridge and Rich Mountain just east of the limits of this Report. The following table gives a list of limestones available in the three counties:

List of Limestones Suitable for Macadam.

Name of Limestone	Geological Series	Approximate Thickness. Feet.	Page on which Described.
Uniontown	Monongahela	2	192
Sewickley	Monongahela	2	195-6
Redstone	Monongahela	5	197-9
Clarksburg	Conemaugh	2	210-12
Orlando	Conemaugh	2	215-17
Elk Lick............	Conemaugh	2	217-18
Johnstown	Allegheny	4	253-5
Greenbrier	Greenbrier	50 to 400	296-7

CONCRETE MATERIALS.

SAND.

Large deposits of sand are to be found along nearly all the larger streams, having been derived from the various sandstones that crop along their course. The best deposits are those that come from the rocks of the Allegheny and Pottsville Series as they contain less silt and argillaceous matter. In some cases these beds of sand contain more organic material than is desirable for use in concrete and the individual sand grains are all somewhat rounded by the wear of the water, but careful search will show numerous deposits along the Tygart Valley, Buckhannon, and Middle Fork Rivers that will meet the necessary requirements of highway concrete material, either for bridges or road surfaces.

SANDSTONE FOR CRUSHING.

An unlimited amount of sand for reinforced concrete structures where tensile strength is desired could be secured by quarrying and crushing the more durable of the sandstone ledges outlined in the table on a previous page. This method would not only secure clean, sharp sand, but would insure absolute freedom from organic or other deleterious matter. The sandstones of the lower Allegheny and Pottsville Series run very high in silica and would furnish an inexhaustible supply of good sand.

LIMESTONE FOR CRUSHING.

Nearly all of the limestones outlined in the table above could be used for concrete aggregate, but the Redstone, Johnstown, and Greenbrier, because of their greater thickness and more uniformly durable character would furnish a more economical and more abundant supply. The Greenbrier could be quarried at very low cost at several localities.

RIVER AND CREEK GRAVELS.

In nearly all the larger streams there are abundant deposits of river and creek gravels that represent the more resistant portions of the sandstone ledges from which they come. These would be suitable either for concrete aggregate or for macadam, being the cheapest material available for either purpose, as they can usually be found within a short haul of the point of consumption.

COAL FOR FUEL.

In nearly every locality of the territory of this Report, coal is available within a short haul of all the principal highways, thus reducing to a minimum the cost of this necessary item required in the various operations of road building. On Maps II and IV, all the principal openings are signified by a mine symbol with a key number attached referring to the description of the mine in Chapter XI. At the end of the same Chapter, the chemical analyses of many of these coals are given showing their precise composition.

CHEMICAL TESTS OF ROAD MATERIALS.

The following table gives a summary of all available chemical tests of materials suitable for road material. Most of these samples were collected by members of the Survey Staff and analyzed by the Survey chemists according to standard methods:

Table of Analyses of Road Materials.

Owner.	Locality.	Kind of Material.	Silica (SiO_2)	Ferric Iron (Fe_2O_3)	Aluminua (Al_2O_3)	Lime (CaO)	Calcium Carbonate ($CaCO_3$)	Magnesium Oxide (MgO)	Magnesium Carbonate ($MgCO_3$)	Potassium Oxide (K_2O)	Sodium Oxide (Na_2O)	Titanium Oxide (TiO_2)	Phosphoric Acid (P_2O_5)	Moisture	Loss on ignition	
	Barbour County:															
Philippi Tile & Brick Co.	Philippi	River Clay	75.91	3.34	11.75	0.37	.....	0.36	.....	1.29	1.01	0.14	0.06	1.50	3.84	99
S. T. Holt Brick Plant	Philippi	River Clay	76.17	4.25	8.28	0.31	.....	0.58	.....	1.25	0.83	0.72	0.07	1.14	5.76	99
Burton Rohrbough	Belington	Clarksburg Fire Clay Shale	50.47	8.67	23.19	0.75	.....	0.65	.....	0.43	0.46	1.03	0.23	4.78	9.83	100
Tygarts Valley Brick Co.	Belington	Thornton Fire Clay Shale	59.17	4.71	22.27	0.26	.....	1.16	.....	2.54	0.88	0.60	0.10	1.12	6.59	99
Frank Maxwell	Peeltree	Redstone Limestone	4.83	.....	3.23	.....	85.93	.....	5.08	.....	.....	.....	0.21	.....	0.23	99
Public Road	Peeltree	Clarksburg Limestone	13.06	.....	6.34	.....	74.05	.....	3.75	.....	.....	.....	0.39	.....	1.43	99
Public Road	Elk City	Elk Lick Limestone	4.97	.....	2.52	.....	86.15	.....	4.66	.....	.....	.....	0.10	.....	0.68	99
P. S. Combs	Calhoun	Lower Freeport Limestone	19.47	.....	11.76	.....	63.36	.....	1.67	.....	.....	.....	0.09	.....	3.16	99
B. & O. R. R. Co.	Meriden	Johnstown Limestone	3.13	.....	2.82	.....	90.75	.....	1.79	.....	.....	.....	0.12	.....	1.72	100
Perry Lawson	Kirt	Greenbrier Limestone	12.62	.....	3.56	.....	80.40	.....	2.26	.....	.....	.....	0.36	.....	1.18	100
	Upshur County:															
Core Brick Works	Buckhannon	River Clay	72.80	5.17	11.81	1.20	.....	0.70	.....	1.49	0.79	0.76	0.22	1.19	4.55	10
Imperial Sand Co.	Imperial	Upper Kittanning Fire Clay	73.40	2.28	14.69	0.80	.....	0.46	.....	2.11	1.10	1.06	0.14	0.67	3.80	10
Imperial Sand Co.	Imperial	Lower Kittanning Fire Clay	77.15	1.67	14.60	0.64	.....	0.16	.....	1.11	0.78	0.71	0.05	0.19	3.48	100
Coal & Coke Ry. Co.	Sand Run	Lower Kittanning Fire Clay	58.28	2.28	26.49	0.50	.....	0.25	.....	2.03	0.93	0.57	0.18	1.43	7.76	10
Peter Engle	Ours Mill	Hammond? Fire Clay	69.13	1.52	19.80	1.13	.....	0.17	.....	1.48	0.89	0.66	0.04	0.44	5.53	100
B. & O. R. R. Co.	Beans Mill	Quakertown Shale	65.81	6.53	16.52	0.74	.....	1.17	.....	2.53	1.08	0.39	0.11	0.56	5.42	100
Lloyd Teter	Pecks Run	Redstone Limestone	9.06	.....	4.02	.....	81.70	.....	3.56	.....	.....	.....	0.08	.....	1.40	9
Imperial Sand Co.	Imperial	East Lynn Sandstone (washed)	99.43	0.15	0.02	.....	0.11	.....	0.19	.....	.....	.....	.....	.....	0.10	10
	Randolph County:															
S. C. Degarmo	Arvondale Junction	Homewood Sandstone	99.18	0.12	0.11	.....	0.11	.....	0.28	.....	.....	.....	.....	.....	0.20	10

CHAPTER XIII.

CLAY, BUILDING STONE, GLASS-SAND, IRON ORE, WATER-POWER, MINERAL WATERS, AND FORESTS.

CLAYS AND CLAY INDUSTRY.

PRESENT DEVELOPMENT.

Brick Plants.

S. T. H. Holt Brick Plant.—The S. T. H. Holt Brick Plant, located along the Tygart Valley River, one-half mile north of Philippi, was started, according to Grimsley[1], in 1876, being located near Philippi, but was moved to its present location in 1887. This concern manufactures red building brick and drain tile. The equipment includes a brick machine with wire cutter and repressing device, one circular, down-draft kiln of 26,000 capacity, and one rectangular, down-draft kiln of 40,000 capacity, the drying yard holding 35,000 brick. The brick are burned 5 to 7 days, natural gas being used for fuel. Seven men are employed with an average monthly pay-roll of $250. The material is secured from an extensive deposit of river clay alongside the plant, having a supposed thickness of about 10 feet of which only the top 3 to 5 feet is used. This clay is a variegated mixture of red and gray, which, according to Joseph Broyles, an employee, is mixed in the proportion of one-third red and two-thirds gray. A sample was collected from the mixture, the composition of which is published in the table of chemical analyses of road materials, page 752. The brick burn to a pale-red color.

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[1] G. P. Grimsley, Vol. III, W. Va. Geol. Survey, p. 273; 1905.

Philippi Tile and Brick Company.—The Philippi Tile and Brick Company, located on the Tygart Valley River just south of Philippi, was established in 1902, according to Grimsley[2], but is not now in operation. The equipment included a pug-mill, augur machine of 35,000 capacity, seven-track tunnel drier, three fourteen-arch up-draft kilns, and one twenty-four-arch up-draft kiln, burned with gas. The clay pit, located just east of the plant, shows 10 feet of yellow residual, loamy clay at the top, and 10 feet of white river clay at the bottom, the two having been evidently used in combination. A sample consisting of one-half from each stratum was collected, the composition of which is published in the table of chemical analyses of road materials, page 752.

Tygarts Valley Brick Company.—The Tygarts Valley Brick Company, located along the Weaver Branch of the Western Maryland Railway, 1.5 miles southeast of Belington, on a small stream tributary to the Tygart Valley River, is not at present in operation. According to B. B. Rohrbough, Secretary and Treasurer, the plant was designed to make paving brick, the equipment including a brick machine of 30,000 daily capacity, 4 driers of 7,500 capacity each, 3 rectangular up-draft kilns of 135,000 capacity each, and 1 similar kiln of 240,000 capacity. The shale was secured from two pits adjoining the plant, the south pit being dug into the hill 100 feet, and having a width of 150 feet and a depth of 20 feet. The north pit is at the same level as the other but not so large. The material consists of 5 feet of residual clay at the top underlain by 15 feet of gray shale that seems to belong at the horizon of the Thornton Fire Clay, both kinds being apparently used in the brick mixture, producing a pale-red brick. A sample was collected from the gray shale, the composition of which is published in the table of chemical analyses of road materials, page 752.

The city of Buckhannon is built on an extensive body of river clay averaging perhaps 20 feet in thickness and a thousand acres or more in extent, that has been used at various localities for building brick, by Coyner, Grosscup, and others. None of these plants is at present in operation but one of them, located near the west edge of town, has been described by Dr. Grimsley in Volume III, of the Survey, pages 275 and 276, as follows:

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[2] G. P. Grimsley, Vol. III, W. Va. Geol. Survey, p. 272; 1905.

"**Grosscup Brick Yard,** started in 1890, is located at the west edge of town. The brick are molded by hand, the clay being tempered in a vertical pug-mill and dried by hot air in a shed room holding 6,500 brick. There are three up-draft kilns, each holding 150,000 and burned with gas.

"The river clay pit is about fifty feet from the river, and bottom of pit is 10 to 15 feet above water-level in the river. The sandy clay has a thickness of 15 feet. This clay is found through the river valley and was worked a number of years ago by two other yards but they have been abandoned. The Grosscup plant makes a million brick a year, sold to local trade. The brick are deep-red color and of good quality for common builders..

"*Chemical Analysis.*

Silica	78.12
Alumina	11.55
Ferric iron	3.28
Ferrous iron	0.34
Magnesium	0.40
Lime	0.26
Sodium	0.14
Potassium	1.32
Water	0.78
Titanium	0.46
Phosphorus	Trace
Loss on ignition	3.50
	100.10

Mechanical Analysis.

	Range in millimeters	
Fine clay	0.00 to .001	13.45
Coarse clay	.001 to .005	8.50
Silt	.005 to .020	23.90
Fine sand	.02 to .150	34.05
Coarse sand	.15 to 1.000	20.10
Water		0.80

"**Physical Properties.**—The Grosscup clay at Buckhannon slakes in a half minute, requires 23 per cent. of water to develop a normal consistency, has a maximum plasticity of 10, air shrinkage of 4½ per cent., and a tensile strength of 86 to 88 pounds.

"This clay is nearly steel hard at cone 1 (2102° F.), reaches incipient vitrification at cone 5 (2246° F.), and is completely vitrified at cone 10 (2426° F.), becoming a black glass at cone 20 (2786° F.). Its fire shrinkage is 8 per cent."

Core Brick Plant.—The Core Brick Plant, located in South Buckhannon along the Buckhannon River a short distance south of South Buckhannon Station, was established a few years ago for the purpose of making building brick, but is not at present in operation. The equipment includes a pug-mill and other necessary machinery for preparing the brick, a square drying shed about 70′ by 70′, and 3 rectangular kilns equipped with gas burners. The raw material was secure from a pit of river clay alongside the plant, showing 15 feet of clay above the level of the river of which about 10 feet was used. Sand was hauled from the river with the evident purpose of tempering the clay. The brick burned to a pale-red color. A sample was collected from the river clay, the composition of which is published in the table of chemical analyses of road materials, page 752.

AVAILABLE CLAY.

Transported Clay.

Along the flood-plains of the Tygart Valley and Buckhannon Rivers, as well as along some of the smaller streams, there are great deposits of clay, varying in thickness from 5 to 30 feet, that are well suited for making common building brick, the demand for which should increase steadily with the increase of the price of lumber. No attempt is made to name these deposits in detail, but Maps II and IV, showing the alluvial deposits in yellow, will be a guide to their occurrence. It should be remembered that plants operating in such abundant material must seek their advantage over competitors by securing the most favorable locations for distribution, fuel, and cheapness of handling raw material.

Residual Clay.

Residual clay, which is derived from weathered rocks, and is still in its original location, is not of sufficient importance to be classed as a brick-making material in the three counties, although it has been used at a few of the plants already described, in conjunction with river clay or shale. These thin deposits of clay should rather be classed as soil, more valuable for agricultural than for other purposes.

Stratified Shales.

Stratified shales, composed principally of silica and alumina, and lying between the sandstone ledges of the Carbonifer-

ous rocks, compose a large percentage of the surfac
in the area of this Report. Nearly all of these sh
material that could be made into brick of some
would therefore be possible for each magisterial
have its own plants for manufacturing building ma
for paving and residence work. A plant of this sor
by convict labor under the present State law, wo
erably reduce the cost of brick for road making.
purposes the red or gray shales of the Conemaugh
scribed in detail in Chapter VI, will be found best s
outcrop of this series is shown on Maps II and I
position of any shale horizon may be easily dete
referring to the general section at the beginning of
ter. The Clarksburg and Pittsburgh Red Shales w
ably make a good grade of roofing tile as well as
The Mauch Chunk Red Shales, coming just belo
of the Pottsville Series, and varying from 300 to 1
thickness, interstratified to some extent with sandst
would furnish an inexhaustible supply of materi
building brick or tile and would probably make g
brick. Maps II and IV show the outcrop of these

Fire Clay.

High-grade refractory fire clays of commercial
and purity are almost unknown in the three coun
Thornton Fire Clay, as described in Chapter VI,
240, was found at a few localities, but apparently l
of the refractory qualities that characterize it at its
ity. The Upper Kittanning Fire Clay, as described i
VII, page 261, was noted at one or two points, bu
thinner than in some of the northern counties. At
of Imperial along the Buckhannon River in Upshu
clay, about 5 feet thick, has been prospected by F.
of Buckhannon, that apparently represents the Low
ning Fire Clay. Mr. Smith furnishes an analys
deposit made by the Pittsburgh Testing Laboratory
signature of H. H. Craver, Chief Chemist, and the

was sampled by the writer, the following being the two results:

	Pittsburgh T. L. Sample	Survey Sample (128-R.)	
Silica (SiO_2)	77.26	77.15	
Alumina (Al_2O_3)	14.23	14.60	
Ferric iron (Fe_2O_3)	1.71	1.67	
Lime (CaO)	0.05	0.64	
Titanic acid (TiO_2)	1.00	0.71	
Magnesia (MgO)	0.20	0.16	
Alkalies	1.26		
Potassium oxide (K_2O)		1.11	1.94
Sodium oxide (Na_2O)		0.78	
Phosphoric acid (P_2O_5)		0.05	
Moisture		0.19	
Loss on ignition	4.40	3.48	
	100.11	100.54	

The following exposure of clay is visible along the Baltimore and Ohio Railroad grade on the land of **Peter S. Engle,** just northwest of **Ours Mill, Meade District, Upshur**:

	Ft.	In.
Shale, gray	3	0
Slate, black	0	6
Coal, Upper Mercer (Exposure No. 844 on Map IV) (1470′ B.)	1	0
Shale, dark, with plant fossils	0	8
Fire clay, flinty, Hammond?	6	0
Sandstone and concealed to grade	10	0

The exact stratigraphic horizon of this fire clay is open to question as the Hammond Fire Clay at its type locality in Marion County belongs above the Upper Mercer Coal. It is possible, however, that the thin streak of coal above this fire clay may be slightly higher in the measures than the true Upper Mercer, and if so then the fire clay should be the Hammond. A sample was collected from this clay, the composition of which is published in the table of analyses of road materials, page 752. The clay is low in iron and fluxing impurities and would have high refractory qualities. According to F. G. Smith, a test showed fusion at Seger cone 30 (3146° F.).

The same bed of clay was prospected by Smith and McLaughlin on the Engle farm at a point about one-fourth mile farther west. The pit was full of water and could not be measured, but the clay shows in the public road near by with a thickness of about 6 feet.

Messrs. Smith and McLaughlin have tested another clay along the Buckhannon River one-half mile north of Beans Mill, where the following exposure is visible in the railroad **cut:**

	Ft.	In.
Sandstone, massive, Upper Connoquenessing, visible	10	0
Fire clay shale, sandy and impure, with some dark slate, Quakertown	12	0
Sandstone, shaly	5	0
Slate, dark, to grade (1750′ B.)	3	0

A sample was collected from this clay horizon, the composition of which is published below, together with the sample analyzed by the Pittsburgh Testing Laboratory:

		Pittsburgh T. L. Sample		Survey Sample (130-R).
Silica (SiO_2)		61.66		65.81
Alumina (Al_2O_3)		21.03		16.52
Ferric iron (Fe_2O_3)		4.71		6.53
Lime (CaO)		0.07		0.74
Titanic acid (TiO_2)		1.20		0.39
Magnesia (MgO)		0.68		1.17
Alkalies	Potassium oxide (K_2O)		2.53	
	Sodium oxide (Na_2O)	3.68	1.08	3.72
	Phosphoric acid (P_2O_5)		0.11	
Moisture				0.56
Loss on ignition		7.14		5.42
		100.17		100.86

The above clay would probably make a good grade of paving or building brick, but, owing to its high content of iron and fluxing agents, would not be suitable for furnace material where high refractory qualities are desired.

BUILDING STONE.

QUARRIES.

In Chapters V to VIII, the various sandstone quarries found in the area under discussion have been described in detail, and classified under their respective geologic names, and in Chapter XII, page 748, the table of sandstones available for Masonry Construction gives a page reference to the description of each ledge that has been quarried.

AVAILABLE STONE.

The sandstones of the three counties, as described in the preceding Chapters, vary from flaggy and shaly beds that do not have the necessary cohesiveness to be used for building stone, to great massive ledges, 50 to 75 feet thick, that will split into building blocks of any desired size. These massive ledges are all of much the same type, micaceous, gray on fresh fracture and often weathering to brown, some of them being very soft and worthless, while others are hard and durable. Most of them do not have the beauty of texture or smoothness of grain to make them desirable for architectural purposes where ornamental or carved stone effects are desired, the Saltsburg Sandstone ledge being in some localities an exception to this rule. In all structures, however, where durability and fire-proof construction are the main features, they can not be surpassed by any stone shipped in from other counties or States. They are fitted for bridge piers and abutments, retaining walls, and for buildings of plain construction. In nearly every locality one or more of these ledges is of massive character and can be quarried. Many of these outcropping have been described in detail in the Chapters on Stratigraphy.

Attention is called to Plate XLIII, showing certain details of the Stuart Duncan residence at Newport, Rhode Island, which is classed as one of the most artistic private residences in America*, and which is built entirely of Saltsburg Sandstone secured from the Kingwood Quarries Company at

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*International Studio, May, 1916.

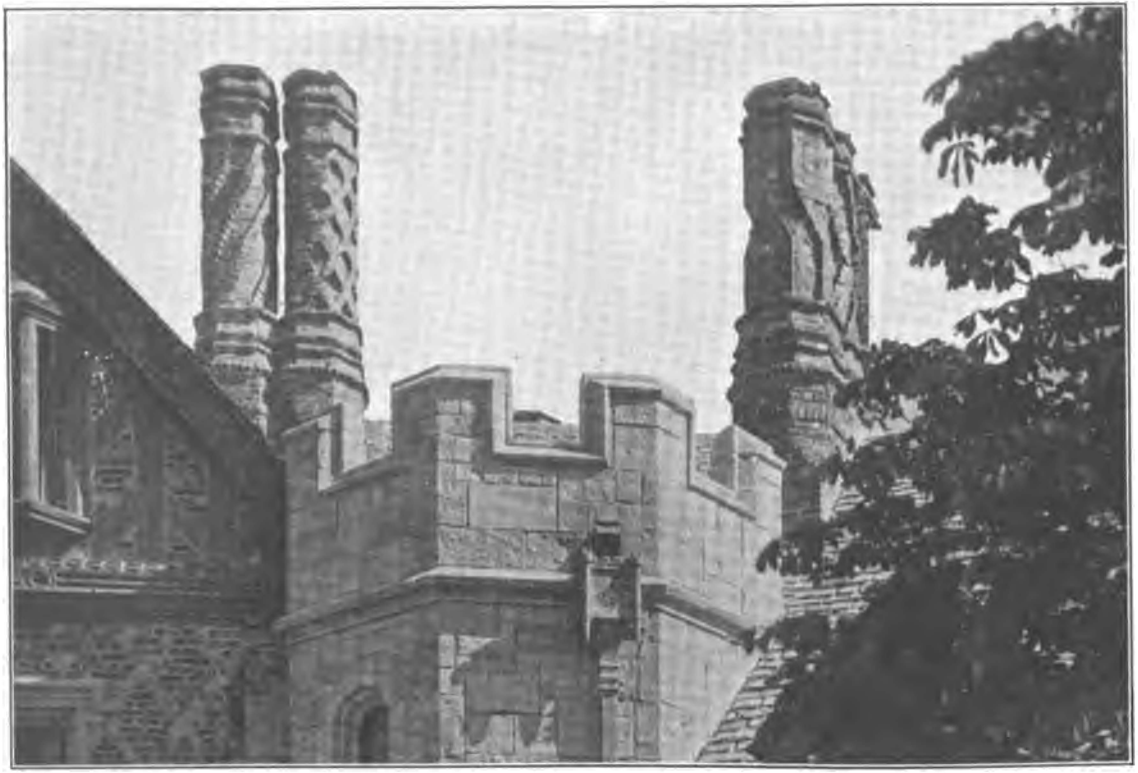

PLATE XLIII.--Detail of Saltsburg Sandstone used in construction of Stuart Duncan residence, Newport, R. I., built of Saltsburg Sandstone from Kingwood (Preston County) Quarry. (Courtesy of John Russell Pope, Architect, New York.)

Kingwood. This plate is a very good illustration of the fine character of the Saltsburg as a building stone. The Survey is indebted to Mr. John Russell Pope, Architect, of New York City, for the photograph.

GLASS-SAND.

QUARRIES.

Imperial Sand Company.—The Imperial Sand Company, with head office at Buffalo, New York, and works at Imperial (Tenmile P. O.), Upshur County, was established in 1912, for the purpose of quarrying glass-sand. The equipment includes a Chaser Sand crusher, with washing device, one Chandler and Taylor boiler of 100 horse-power, and one 75 horse-power engine, an air-compressor and the necessary sand bins and quarrying equipment. The capacity is 100 tons of sand daily, and output 60 tons, most of which is used for window glass in the factories of Buckhannon, Weston, Clarksburg, and other West Virginia towns. Coal for power is mined alongside the quarry (See description of Imperial Sand Company Mine, No. 687 on Map IV). The sand works and mine employ 20 men when running full, according to J. C. Ervin, Superintendent. The quarry is 125 feet long and extends into the hill 50 feet, showing the following section:

		Feet.
1.	Coal blossom and fire clay, Upper Kittanning........	
2.	Sandstone, shaly....................................	5
3.	Sandstone, massive, good, quarry rock, East Lynn...	39

So far as known the above plant is the only one in the State using the East Lynn Sandstone for glass-sand. A sample was collected from the washed sand in the bins, the composition of which is published in the table of chemical analyses of road materials, page 752, the silica content being 99.43 per cent.

Silica Sand Company.—The Silica Sand Company opened a plant at Craddock, Upshur County, in 1905, but after several years of operation, the buildings and equipment were destroyed by fire and have never been replaced. Sand was obtained from the Homewood Sandstone of the Pottsville Series, which in that region contains too many pebbles to make ideal glass-sand. A complete description of this plant is given by Dr. G. P. Grimsley, in Volume IV, pages 389 and 390, of the State Survey Reports, the washed sand showing 99.20 per cent. of silica.

Enterprise Silica Sand Company.—The Enterprise Silica Sand Company, of Bellaire, Ohio, built a glass-sand plant at Silica Station, Randolph County, in 1904, according to Grimsley, but was soon abandoned and has now been completely dismantled. The Homewood Sandstone was quarried, the pebbly nature of which doubtless contributed to the failure of the concern.

AVAILABLE SAND.

The East Lynn Sandstone, quarried with success at Imperial, crops for several miles along both sides of the Buckhannon River in Meade and Washington Districts, Upshur, and is also a massive ledge at numerous other points in the three counties. Whether its chemical content is such that it can be generally used for glass is a question that individual prospecting must solve. Its outcrop has been fully described on pages 255-260.

The Homewood Sandstone ledge, as previously described. pages 267-9, crops over a wide area and is apparently low enough in silica at numerous points for glass making. A sample collected near the residence of S. C. Degarmo, just west of Arvondale Junction, Randolph County, showed a silica content (unwashed) of 99.18 per cent., as published in full in the table of chemical analyses of road materials, page 752. Unfortunately this ledge usually carries numerous quartz pebbles, which, because of their high fusing point, make the sand objectionable for glass making. There are doubtless local deposits of considerable extent where pebbles do not occur in troublesome quantity.

It is possible that some of the other sandstone members of the Pottsville Series might have the necessary chemical character for glass-sand. The general regions of their outcrop are shown on Maps II and IV.

IRON ORE.

OLD FURNACES.

Valley Furnace.—Valley Furnace, the only structure of its kind built to produce pig iron in the territory of this Report, was located at the present village of Valley Furnace, on Brushy Fork of Teter Creek, Cove District, Barbour. Concerning this old furnace, Maxwell[8] says the following:

> "The furnace on Brushy Fork was built in 1848 and was used six years. The blast was operated first by water-power and afterwards by an engine (believed to have been the first in Barbour County, about 1850). It was thirty-nine feet high when built, but is little more than half of that now, much of the stone of which it was built having been removed for various purposes. The fuel was charcoal, and about 9,000 pounds of iron were produced a day. This was hauled by mule teams to Fairmont, where it was loaded on steamers. The furnace stands on a seam of coal which was not used for fuel. The old stack is now overgrown with weeds and brush."

The ore used at this old plant was secured from nodules of iron carbonate bedded at irregular intervals in the Bolivar Fire Clay which comes just below the Upper Freeport Coal. The clay deposit is flinty and reddish colored, with a maximum thickness of 25 feet, the total percentage of the iron nodules being very small. The lean character of the ore and the long haul to market evidently soon discouraged the promoters of this early enterprise.

POSSIBLE ORE-BODIES.

No iron ore deposits of commercial significance, other than the one noted above, were noted in the territory of this Report. The deposit at Valley Furnace seems to be a local occurrence as iron ore was not found in any quantity elsewhere in this clay stratum. Possibly the most hopeful future iron resource of the three counties is the red Mauch Chunk Shale, which contains about 10 per cent. of iron, and which, because

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[8] Hu Maxwell, History of Barbour County, p. 318; 1899.

ized by

of its abundance and the ease with which it could be handled and refined in a region that is well supplied with coal, might at some future time be a source of commercial ore. No attempt to handle this material would likely prove successful, however, until the rich deposits of the Lake Superior and other regions of the world have approached exhaustion.

WATER-POWER.

AVAILABLE STREAMS.

No attempt has been made to utilize the streams of the three counties for hydro-electric power, although numerous water-wheel mills have been built along the creeks and some of these are still in operation. The streams worthy of attention for commercial-power development are the Tygart Valley, Buckhannon, Middle Fork, and Little Kanawha Rivers, all of which have a variable run-off much greater in spring and winter than in summer and fall. Of these streams, gage readings are available only for the Tygart Valley at the Belington Station which is located above both the Buckhannon and Middle Fork Rivers. These records have already been published under the description of this drainage basin, pages 37-53.

The three rivers first mentioned above all offer some favorable sites for water-power projects, but their development would lead to many legal difficulties owing to the extensive mining, railroad, and agricultural rights that would be jeopardized, and the competition furnished by cheap coal for steam-developed power would be most severe, making it doubtful whether hydro-electric plants would prove profitable.

The following table, showing indicated horse-power developed by streams flowing through the three counties, is compiled from Tables 12 and 15, pages 416 and 417, of the Semi-Centennial History of West Virginia, by Dr. J. M. Callahan, the tables in question being part of a special article on "Water-Power Resources" by A. H. Horton, District Engineer, Water-Resources Branch, U. S. Geological Survey:

Indicated Horse-Power Developed by Tygart Valley River and Tributary Streams.

Stream	Section		Length. Miles.	Mean Drainage Area. Square Miles	Minimum Discharge. Sec.-Feet	Assumed Discharge for Maximum Development. Sec.-Feet	Total Fall. Feet.	Minimum Horse-Power	Assumed Maximum Development. Horse-Power	Horse-Power Available from Storage for		
	From	To								12 Mos.	6 Mos.	3 Mos.
Tygart Valley River	Source	Below Pond Mill Run	19	a 89	7	46	1,800	290	1,900			
Tygart Valley River	Below Pond Mill Run	2 Mi. above Roaring Creek	31	205	16	106	280	412	2,700			
Tygart Valley River	2 Mi. above Roaring Creek	Above Middle Fork	16½	379	30	197	250	690	4.530	12,900	25,800	51,600
Tygart Valley River	Below Middle Fork	Above Buckhannon River	3½	596	48	310	155	684	4,420	11,200	22,400	44,800
Tygart Valley River	Below Buckhannon River	Below Frog Run	23	1,080	86	520	320	2,530	15,300	40,200	80,400	160,800
Tygart Valley River	Below Frog Run	Above West Fork River	28	1,320	106	630	135	1.310	7,820	18 800	37,600	75,200
Middle Fork River	Source	Below Cassity Fork	15	a 65	5	34	1,200	138	940			
Middle Fork River	Below Cassity Fork	Mouth	25	113	9	59	540	447	2,930			
Buckhannon River	Source	Alexander	17	a 90	7	47	1,800	209	1,410			
Buckhannon River	Alexander	¼ Mi. above Sand Run	33	200	16	104	470	692	4,490			
Buckhannon River	¼ Mi. above Sand Run	Mouth	11	330	26	171	60	144	944			
Sandy Creek	Source	Mouth	20	a 84	7	44	1,000	161	1,010			

a—Total Area.

MINERAL WATERS.

No medicinal springs are being exploited as such in the territory of this Report and none of consequence are known to exist. There are sulphur springs at various localities and at some points sulphur water has been found in borings for oil or coal. The E. D. Talbott Heirs No. 2 Oil Test (17), located one-half mile west of Philippi, has an artesian flow of salt sulphur water which has been used to a limited extent by residents of Philippi. The Wm. Corley No. 9 Coal Test Boring (108), located along the Tygart Valley River at the Roaring Creek Junction Railroad Station, has an artesian flow of fine sulphur water that has been used for local consumption in Elkins.

A large number of the tests drilled for oil and gas have found copious flows of salt water in various members of the Pottsville or Salt Sand Series, but so far as known, no tests to determine the salinity of this brine have been made.

FORESTS.

BARBOUR COUNTY.

In Volume V, pages 106-108, of the State Survey Reports, by A. B. Brooks, State Forester, there is a description both of the original and present forest conditions and the lumber industry, that is of pertinent interest and is here republished not only to show what timber is now available, but also to show what is likely to thrive, should reforestation be taken up:

"Original Forest Conditions.

"Almost the whole area was once covered with a dense growth of hardwoods. The region on the west, drained by Gnatty Creek, Elk Creek, and Brushy Fork, should be especially mentioned in this connection, for it is doubtful if any portion of the State produced a heavier and a more excellent stand of timber. Here in the valleys of the streams and in the numerous rich coves, the yellow poplar, sugar maple, oaks, hickories, black walnut, white ash, basswood, chestnut, cucumber, and many others, grew abundantly. All of Pleasant District, on the northwest, and the drainage basins of First and Second Big Runs and Pecks Run in Union District on the southwest were also noted for their hardwood forests. Eastward from the Tygart Valley and Buckhannon Rivers there are large areas which are less fertile than in the localities mentioned above, and in these the original forests contained fewer species and lighter stands of timber trees. The prevailing timber trees in the eastern part along Laurel Ridge were chestnut, locust and chestnut oak on the ridges and flats, with poplars, ashes, cucumbers and others in the rich coves and with hemlock, birches and beech along the streams.

"The Lumber Industry.

"Some sections of the county have been settled for 140 years; and in these nearly all the timber of the original forests was destroyed in clearing the land for cultivation. Before the year 1860 most of the residences and out-buildings were made of logs. The small amount of lumber used in an early day was manufactured by hand-operated whip saws and by 'up-and-down' water sawmills. There was an abundance of straight-grained yellow poplar, chestnut, red oak, and black walnut timber for fence rails, shingles, boards and puncheons, without using the curly walnuts, knotty oaks and twisted chestnuts, which were all classed together and burned as worthless timber.

"A few of the primitive mills which operated approximately between the years 1845 and 1875 were Shuttleworth's mill near Peeltree, Hall's mill, Teter's mill and McCoy's mill, on Buckhannon River, Kittle's mill at Georgetown, Stout's mill on Tygart Valley River, and the Nicola mill at Moatsville. Some of these were at first run by water and later by steam. One of the first stationary steam saw and grist mills in the county was built about the year 1856 at Peeltree by John Maxwell. This mill sawed lumber for local use during a period of 30 or 40 years.

"About the year 1883 a narrow-gauge railroad was built from Grafton to Philippi and a few years later was widened to regular gauge and extended up the Tygart Valley River to Belington. Immediately after the completion of this railroad portable sawmills were stationed, first along the line and later farther back, toward the heads of the streams. Since then there has been a continual operation of portable mills in all sections where merchantable timber could be found. The principal shipping points for lumber have been Moatsville, Belington, Philippi and Clements. There have been no band sawmills in the county. Considerable timber from along the river, however, was drifted out and manufactured about 25 years ago on Curtin's band mill at Grafton and later by G. C. Blatchley at the same place.

"The Present Forest Conditions.

"The only forest land of any consequence now remaining in the county lies in a belt from 1 to 3 miles wide extending along the western face of Laurel Ridge on the east and adjoining Randolph and Tucker Counties. There are a few small virgin areas in that section which contains in the aggregate about 1,000 acres, and approximately 12,000 acres of cut-over forest. There are about 3.000 acres of cutover forest, also, lying in broken tracts along the Tygart Valley and Middle Fork Rivers from a short distance above Philippi to Clements.

"The small areas of woodland throughout the county are principally connected with cleared farm land and contain only a small stand of merchantable timber."

Areas Suitable for Reforestation.

A large proportion of Barbour is such fine agricultural and grazing land that it is highly improbable that much of it will ever be reforested, as those portions of the county where the Monongahela and upper two-thirds of the Conemaugh Series outcrop are natural blue-grass land and therefore extremely valuable. If the need of reforestation should arise, the most suitable areas would be the great eastern slope of the Laurel Ridge, which without exception is rough stony land, and those sections of the Tygart Valley River hillsides where the Pottsville Series crops, one of these being located between Arden and the Taylor County Line and the other between Philippi and Belington.

Forest Protection Service.

Some of the large landowners in southern Barbour are subscribers to the Central West Virginia Fire Protective Association, a semi-official organization, supported in part by State and Government funds, but largely by private assessment based on acreage. This association has several lookout stations and patrol routes in Barbour and adjoining counties, and since its organization has saved much valuable timber from fire.

Lumber Mills.

Most of the timber at present sawed in the county is handled by small portable mills, no account of which is available. The following is the principal woodworking establishment of the county:

J. W. Thornhill Lumber Company.—The J. W. Thornhill Lumber Company, established in 1906 as the Belington Planing Mill Company, and transferred to its present ownership and management in 1912, is located on the Weaver Branch of the Western Maryland Railway, one mile south of Belington, which is its headquarters. According to A. M. Woltz, Superintendent, the plant manufactures sash, doors, moldings, and general mill work, employing 30 men, of whom 15 are skilled laborers, the monthly pay-roll being $2500.

UPSHUR COUNTY.

In Volume V, pages 293 to 300, of the State Survey Reports, there is a description of the forest resources of Upshur County, from which those portions relating to original and present forest conditions and the lumber industry are republished here, as follows:

"Original Forest Conditions.

"Yellow poplar, black walnut, white oak, red oak, and chestnut may be named as some of the most valuable hardwoods of the county. Other common hardwoods were sugar and red maple, black birch, shellbark and pignut hickory, black gum, beech, chestnut oak, scarlet oak, black oak, white ash, locust, sycamore, and white walnut. Cucumber, basswood, and some others were distributed locally. Shingle oak grew along the Buckhannon River as far up as Hampton, and a very few trees of swamp white oak were to be found on the low lands in the vicinity of Lorentz, 4 miles west of Buckhannon.

"Hemlock once grew on the rough stony soil of Buckhannon River and its larger tributaries as far north as Sago; on nearly all the tributaries of the Right and Left Forks of the Little Kanawha in the southern end; and to some extent along the Middle Fork River. There were also narrow fringes of hemlocks along the tributaries of West Fork River which head in the county. No other softwoods—not even in small quantities—grew within the area.

"The quality of poplar, black walnut, and hemlock was good. White oak and chestnut were damaged to some extent by insects.

"The Lumber Industry.

"The destruction of timber by the pioneers of the county was enormous, as large settlements were begun and large openings made in the original forests many years before the establishment of a commercial lumber industry. It is of interest that the first white men who lived in the county made their home for two years in the hollow of a gigantic sycamore tree which grew near the mouth of Turkey Run, a tributary of the Buckhannon River. These men were John and Samuel Pringle, deserters from the royal army at Fort Pitt during the French and Indian War. When the war was over they left the region for the settlements on the South Branch. In 1768 Samuel Pringle acted as guide for the first settlers who built their homes along the Buckhannon River and its larger branches not far from the town of Buckhannon. In 1772 others came from the same settlements and established homes farther up the river and on Hackers Creek. Settlements were made at Sago in 1801, at French Creek in 1816, at Queen in 1817, and by 1825 there were families living in every district.

"Sawing for domestic use was begun over a hundred years ago. The first lumber was sawed with whip saws which were operated by hand. A few years later rude water-power sawmills were built along the creeks and rivers in several localities. The following list of sash sawmills with dates and locations is taken from Cutright's History of Upshur County:

"*Owners.*	*Date of Building*	*Location.*
"John Strader & Henry Reger	1806	Spruce Run.
John Jackson	1810	Buckhannon.
Zedekiah Morgan & Patrick Peebles	1810	Sago.
Aaron Gould	1813	French Creek, (Meadville)
James Bunten	1825	Sago.
Elbridge and John Burr	1832	French Creek.
Aaron Liggett	1853	Glady Fork.
Chipps & Wamsley	1864	Grassy Run.
Lewis	1874	Big Sand Run.
Hinkle	1878	Big Sand Run.

"There were also B. W. Phillips' mill and Houghton's mill on Laurel Fork of French Creek, Abram Crites' mill at Selbyville on the Buckhannon River, Pringle's mill at Alton on the Buckhannon River, Wilson's mill at Stillman on the Little Kanawha, Marshall Wingrove's mill on French Creek, and several others.

"It is probable that Abraham Hinkle operated the first steam sawmill on Cutright Run, a tributary of the Buckhannon River, in the year 1867. About ten years later W. F. Hollen built a mill of the same kind in Union District and operated it for a number of years.

"The commercial lumber industry began with the building of the railroad to Buckhannon in 1883 and was greatly increased by its extension up the Buckhannon River a few years later. Since that time there has been an extensive industry throughout the whole Buckhannon River basin carried on by scores of large and small operators. A few of these are mentioned below:

"Floyd Brown and William Mearns both operated mills on the waters of Little Kanawha, beginning about 1885. The former sawed at Stillman, Getout Run, and in other places in that region; the latter, with his sons, continued to operate for many years in the vicinity of Rock Cave and in other parts of the southern end. Fidler and Huff had a steam mill on Kanawha Run as early as 1888. Fidler's mill on Kanawha River at Arlington should be mentioned also as one of the pioneer stationary operations.

"A. G. Giffin began in the county by buying hickory. This he sawed and shipped to Pennsylvania. Later he cut poplar and other timber on his own mill and on several rented mills. Still later he acquired the plant built by the Buckhannon River Lumber Company at Buckhannon. Much lumber manufactured by himself and by others in the region was dressed on his planing mill located in Buckhannon. His operations covered the period from 1883 to 1891.

"The Buckhannon River Lumber Company came in soon after the railroad was built to Buckhannon. This company operated a circular mill at Buckhannon and another at Tenmile, and hired a third mill near the latter town. Many of the logs for the Buckhannon mill and the lumber from the Tenmile mills were brought down the river on a tram-road. A large number of logs were brought down from lands high up on the Buckhannon River, some being floated and others hauled by the company's locomotive after the West Virginia and Pittsburgh Railroad was extended to Newlon in 1891. About the year 1892 the mill was sold to Winchester and Craddock, who soon after remodeled it, installing a band in place of the circular saw.

"G. F. Stockert came to Upshur County from Lewis in 1888 and began operations with the Buckhannon River Lumber Company. Later he and his brothers sawed on Little Bush Run, a tributary of

French Creek, and on Kanawha Run a tributary of the Little Kanawha River. He also cut about 8,000,000 feet on Big Run near the town of Alton. From there he went to Panther Fork where he erected a large circular mill. Here from 1895 to 1900, he cut about 12,000,000 feet of fine timber from a tract of 3,600 acres and then sold out to Isherwood and Cody. Later he sawed near Alton and in other parts of the county. At present he is superintending operations on the Kanawha River near the town of Holly Grove.

"Alexander Lumber Company, with a band mill at Alexander, cut timber from a large tract on the Left Fork of Buckhannon River between the years 1889 and 1894.

"Col. Sellars operated a circular sawmill at Tenmile between 1889 and 1892.

"Alton Lumber Company erected a portable mill at Alton in the spring of 1891 and cut the timber from 1,200 acres of land on Buckhannon River and Laurel Fork of French Creek. This company, with offices in Buckhannon, is now engaged in the wholesale lumber business and is interested also in the manufacture of lumber in Randolph and Barbour Counties.

"Smoot Lumber Company operated a portable mill at Tenmile from about 1892 to 1898.

"Fell and Stranahan sawed the timber from a tract of 600 acres near Tenmile between the years 1893 and 1895.

"Isherwood and Cody sawed about 15,000,000 feet of lumber from their own lands on Panther Fork between 1900 and 1908.

"Others who have operated portable mills are Crosby and Beckley Lumber Company on Big Run, near Alton; Jenkins and Cochran near the village of Canaan; J. H. Grogg on French Creek and other Buckhannon River tributaries; William Burner near the town of Sago; and Phillips Brothers on the Buckhannon River from Sago to Alton.

"The 3 principal lines of steel railroad built in the county for hauling logs and lumber are the 17-mile line built up the Left Fork of Buckhannon River by the Alexander Lumber Compeny in 1890; the 15-mile line built by G. F. Stockert on Panther Fork and Middle Fork waters; and the recently constructed line from Frenchton to the Kanawha River in use by the Buckhannon Lumber Company.

"The principal operations now in the county is that of the Croft Lumber Company with a single band mill located at Alexander.

"Not fewer than 30 sawmills, with capacities ranging from 1,000 to 8,000 feet a day, are operating principally in the southern end of the county and along the Coal and Coke Railroad in the central sections.

"Present Forest Conditions.

"There are 4 or 5 virgin forest areas, aggregating about 1,500 acres, still remaining in the southern end of the county, principally in the Kanawha River basin. Most of the cut-over forest lands lie in the scattered tracts along the Buckhannon River south of Sago, and in the extreme southern end of the county along the Randolph and Webster Lines. The largest areas are in the vicinity of Alton, on both sides of the Buckhannon River, and on the rough lands which slope to the Right and Left Forks of the Little Kanawha near Cleveland. The total area of cut-over forest land is about 17,000 acres.

"The remaining 190,000 acres, or more, of land in the county is owned by farmers. In Warren and Buckhannon Districts in the northern end not less than 85 per cent. of the land is cultivated or in grass.

In the southern and eastern parts the percentage of cleared land is much lower. The farmers, as a rule, have woodlots that contain some merchantable timber and that are well stocked with a young growth of valuable species of hardwoods."

Areas Suitable for Reforestation.

Northern and central Upshur has much the same soil as western Barbour, the outcrop of the Monongahela and upper portion of the Conemaugh Series making land that is unexcelled for grazing and agricultural purposes and that is far too valuable for reforestation. Southern Upshur, however, has a large amount of Pottsville and Allegheny outcrop that might well be reforested as much of it will not hold grass and will not pay for the labor of cultivation.

Lack of Forest Protection.

No general system of forest protection is in force in Upshur, most of the lumber companies depending on their own efforts to guard against fire.

Lumber Mills.

The various woodworking plants of Buckhannon, including the **William Grosscup Planing Mill, Upshur Planing Mill, Buckhannon Box and Resaw Company, and Layfield Manufacturing Company,** have already been described in the account of the miscellaneous industries of Buckhannon, pages 21-22. In addition to these, information is available on the following large mills in the county:

Croft Lumber Company.—The Croft Lumber Company, of Philadelphia, Pennsylvania, built a lumber mill at Alexander on the Buckhannon River, in 1909, on the site first occupied by the Alexander Boom and Lumber Company and later by Hart Brothers. According to L. E. Keller, Bookkeeper, the output consists mostly of undressed lumber, the daily capacity being 75,000 feet for hardwood or 100,000 feet of soft wood. About 65 men are employed on the mill, and about 60 on the construction gangs and operating force of the Alexander and Eastern Railroad, a leased line that hauls the logs from the forests of Randolph County.

Buckhannon Chemical Company. — The Buckhannon Chemical Company, with head office at Selbyville, West Virginia, and works at Chemical, West Virginia, was established in 1908. According to William McDade, General Manager, the plant manufactures wood alcohol, acetate of lime, and charcoal, consuming 18,000 cords of wood annually. About 100 men are employed in the mill and woods gangs with an average monthly pay-roll of $8,000. The raw material is mostly beech and maple from the cut-over forests not far from the mill. The equipment includes 6 retorts of 10 cords capacity each, 3 coffee stills, one 10′ by 20″ lime-lees still, two 10′ by 10′ alcohol-stills, one 7′ by 7′ wooden tar-still, and three boilers of 150 horse-power and one of 65 horse-power. The Chemical and Helvetia Railroad, a separate corporation that hauls the cord-wood to the mill, has already been described, page 4.

RANDOLPH COUNTY.

In Volume V, pages 261-267, of the State Survey Reports, there is a description of the forests and mills of Randolph, no mention being made of original forest conditions. The account of the lumber industry and present forest conditions, embracing a considerable territory outside the limits of this Report, is given below:

"The Lumber Industry.

"Although there were settlements in Randolph County as early as 1772, most of the forest land remained undisturbed for a hundred years thereafter. Outside of the valleys of Tygart Valley River and of Leading Creek the territory was slowly occupied, being mostly high, mountainous land and unfit for farming purposes.

"The dwelling houses and out-buildings of all the pioneer settlers were constructed of logs for the first 50 years and only a few were built of sawed lumber for many years after that time. One or two water sawmills manufactured a meager supply of lumber for the farmers of the upper Tygart Valley in an early day. According to Maxwell's History of Randolph County, 'The first sawmill in Mingo was built by Edward Woods and John Smiley at the Laurel Thicket on H. C. Tolly's place near Valley Head, in 1822. The wagon which hauled the irons for the mill was the first that crossed the mountain to Mingo. It was driven by Augustus Woods, who cut the road as he came.' This was one of the first sawmills in the county, and perhaps the only one for several years. Martin's list of 1835 gives 1 sawmill in Randolph County.

"From about 1865 to 1895 there were a great many logs floated on the Cheat and Tygart Valley Rivers. The first timber sold in the county was taken out by water. Some of the best poplar, ash, cherry, and black walnut went in this way. Pardee and Curtin Lumber Company of Grafton got a large percentage of the logs floated on the Tygart Valley, and those floated on the Cheat went largely to Rowlesburg and Point Marion. Dewing and Sons sawed some of the first spruce that was cut in West Virginia on a large circular sawmill located at Point Marion. Col. A. H. Winchester, with headquarters at Cheat Bridge, superintended the cutting of timber on the company's extensive holdings on Shavers Fork from about 1888 to 1896. The logs made the long journey from almost the head to the mouth of Cheat River.

"The steam sawmill industry began in the year 1878 when a portable mill was brought from Virginia and put in operation on Dry Fork of Cheat. Others soon followed this and by the year 1890 several were running in different parts of the county.

"A more active industry followed the building of the railroads which made accessible the great coniferous and hardwood forests. The principal railroad lines were built approximately as follows:

"From Parsons to Elkins	1889.
From Elkins to Beverly	1891.
From Beverly to Huttonsville	1898.
From Newlon to Pickens	1892.
From Roaring Creek Junction to Coalton	1903.
From Elkins to Durbin	1903.

"Within the last 12 years the lumber industry has increased at an amazing rate. Huge band mills have taken the place of smaller operations in all the large forest areas and are now manufacturing lumber at the rate of a million feet a day. No fewer than 15 band mills located within the county and several on the outside, as well as a number of smaller portable sawmills, are cutting timber from the Randolph forests. Below are given the names of the band saw operations with the date on which they began in the county:

"Parsons Pulp and Lumber Co., Horton, on Gandy Creek	1894
Holly Lumber Co., Pickens, on Buckhannon River	1900
Tygart River Lumber Co., Millcreek, on Mill Creek	1902
Parsons Pulp & Lumber Co., Laneville, on Red Creek	1905
J. M. Bemis & Son, Bemis, on Shavers Fork	1905
Glady Fork Lumber Co., Glady, on Glady Fork	1905
Wheeler Lumber Co., Glady, on Glady Fork	1905
Moore, Keppel & Co., Ellamore, on Middle Fork	1906
Elkins Pail & Lumber Co., Elkins, on Tygart Valley	1906
Brown & Hill, Montes, on Shavers Fork	1906
Raine-Andrews Lumber Co., Evenwood, on Glady Fork	1906
Perley & Crockett Lumber Co., Jenningston, on Dry Fork	1906
United Lumber Co., Hazelwood, on Dry Fork	1908
Wyoming Lumber Co., Laneville, on Red Creek	1908
Laurel River Lumber Co., Jenningston, on Dry Fork	1909

"A few of the large lumber companies which have already completed their operations in the county are given by Mr. C. W. Maxwell, of Elkins, as follows: Morribell Lumber Company, at Morribell, 1901 to 1908; Beulah Lumber Company, at Beulah, 1901 to 1908; McClure, Tyson & Irving, at Glady, 1901 to 1909; J. B. Moore & Son, at Gilman, 1901 to 1908; Mabie-McClure Lumber Company, at Mabie, completed work in 1908; Himmelrick Lumber Company at Coalton, 1895 to 1908; and Jenningston Lumber Company at Jenningston, sold to Laurel River Lumber Company in 1908.

"No definite data have been collected regarding the cutting of ties, poles, staves, shingles, etc., in the county, nor of the cutting of the large number of chestnut oaks for tan-bark.

"Present Forest Conditions

"There are probably not far from 125,000 acres of cleared land in the county. Of this approximately one-half lies along the bottoms and foot-hills of the Tygart Valley River and Leading Creek, and the other half in the region of Helvetia on the southwest, in the mountainous limestone region on Dry Fork of Cheat, and in small farms scattered throughout the area.

"The great virgin forests—aggregating about 195,000 acres—lie principally on the Cheat waters east of the crest of Cheat Mountain, and on the headwaters of Middle Fork River. It is said that about 85,000 acres of this contains spruce timber in varying quantities. Hemlock is found in abundance on almost every tract. There are almost 200,000 acres of cut-over forest land in the county. This lies in large and small areas throughout the forest region adjoining the lands which have not yet been cut over. In some sections, notably along Gandy Creek and Glady Fork of Cheat, fire has killed the young growth that was left by the lumbermen and thousands of acres now contain nothing more valuable in the way of tree species than wild red cherries and yellow birches. In some places even these have been killed and a dense growth of blackberry briers and ferns has sprung up in their places. There is an area of large extent on the Roaring Plains, where the eastern line of the county follows the crest of Alleghany Mountains, which is almost entirely without vegetation of any kind. The frequent fires in the region not only destroyed the trees and shrubs but the soil also.

"Granting that there are 4 billion feet of timber yet standing in Randolph County (a high estimate) there are enough mills now at work to cut every foot of it inside of 15 years. Some companies, however, own a sufficient quantity of timber to keep them operating a few years longer than that. According to information obtained from the lumber companies listed above only 5 of them will be operating in the county 10 years hence and these will be nearing the completion of their work. Almost every acre of virgin forest in the county is in the hands of operators or is likely to be within a very short time.

"It is gratifying to note that at least one lumber company—the West Virginia Pulp and Paper Company—is making extensive plantations of spruce trees on its cut-over lands near the head of Shavers Fork of Cheat River."

Areas Suitable for Reforestation.

Almost the entire area of the western portion of Randolph County belonging in the scope of this Report is covered with the rough stony weatherings of the Pottsville Series and therefore little suited for grazing or cultivation. The Allegheny Series making a thin soil little better than the Pottsville covers a portion of the surface along the Belington Syncline in the vicinity of Roaring Creek and westward toward Middle Fork River, this country being smoother and better adapted to agriculture. A very considerable portion of the Pottsville areas are still in woodland, either virgin or cut-over, and in view of the very great need of flood control, forest conservation, and water-supply, it would seem advisable to keep a very great portion of this land in perpetual forest.

Forest Protection Service.

Nearly all of the wooded land in western Randolph is under control of the Central West Virginia Fire Protective Association, with its system of lookouts and patrols and is therefore well protected against fire.

Lumber Mills in Western Portion.

Moore-Keppel & Company.—The principal mill of western Randolph is that of Moore-Keppel & Company, operating at Ellamore on the Middle Fork River, established in 1906. This company has a large band sawmill and a separate plant for turning out wagon hubs. Its broad-gauge railroad extends from Midvale on the Coal and Coke Railway up the Middle Fork River to Adolph, tapping one of the best areas of virgin hemlock in the State.

PART IV.

Paleontology

CHAPTER XIV.

NOTES ON THE PALEONTOLOGY OF BARBOUR, UPSHUR AND THE WESTERN PORTION OF RANDOLPH COUNTIES.

Invertebrate Fossils from the Conemaugh and Pottsville Series.

By W. Armstrong Price.

INTRODUCTION.

The area covered by the following report upon invertebrate fossils consists of Barbour and Upshur Counties, including the region lying in the western portion of Randolph County chiefly west of Rich Mountain. One collection from the edge of Lewis County bordering on southwestern Upshur is included. The fossils studied were collected chiefly by Mr. D. B. Reger, with some collected by Messrs. Ray V. Hennen and D. D. Teets. These were small lots obtained incidentally to the prosecution of their stratigraphic and economic studies and were designed to be supplemented by further collecting, which has not as yet been done. In the case of the Orlando, Ames and Pine Creek horizons the collections are by no means representative of the total fauna of these beds. The collections from the Brush Creek are five in number and are fuller than those from the overlying strata. Several of the latter were made by the writer while engaged in collecting fossils from Lewis County. An almost representative collection may sometimes be obtained from this bed from small amounts of material because the shale is highly fossiliferous and many of the species small. The collections from the Pottsville horizons are considered to be representative of those faunas in the area studied. These faunas are restricted in variety and the horizons are not everywhere fossil-bearing. Further collecting from the two known exposures of the Kanawha Black Flint horizon is desirable and may be expected to yield other species in addition to those herein enumerated. However, it is reported by Reger to be only sparingly fossiliferous. Ten species not previously noted in the Brush Creek limestone in the state have been found in these collections and further collecting from this horizon also is desirable. The Orlando limestone warrants further study. The collections obtained from it are yet to be fully investigated. The study of the Pottsville horizons of these counties in their relation to the thin Pottsville section lying to the north of this area offers results of value. This study has been begun.

The accompanying map, Figure 21, shows the progress of the studies of the invertebrate fossils of the Pennsylvanian strata to the date of writing.

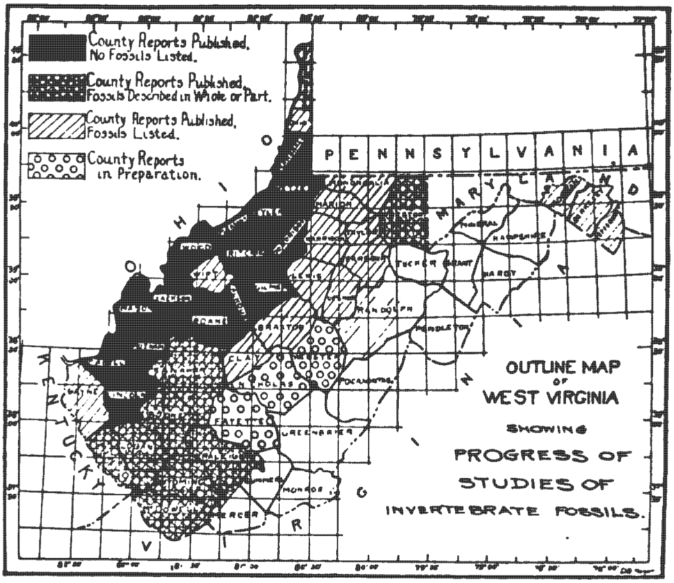
County Reports Published, No Fossils Listed.
County Reports Published, Fossils Described in Whole or Part.
County Reports Published, Fossils Listed.
County Reports in Preparation.
OHIO
PENNSYLVANIA
MARYLAND
KENTUCKY
VIRGINIA
TUCKER
GRANT
HARDY
RANDOLPH
PENDLETON
BRAXTON
CLAY
NICHOLAS
WEBSTER
FAYETTE
GREENBRIER
MONROE
MERCER
OUTLINE MAP OF WEST VIRGINIA SHOWING PROGRESS OF STUDIES OF INVERTEBRATE FOSSILS.

Figure 21. Showing Progress of Studies of Invertebrate Fossils.

FAUNAL HORIZONS.

The fossil-bearing beds of rock in the area of this report are shown in the accompanying table, in which are given the total thickness of each series and a description of the fossiliferous members, with the vertical distance in feet of the base of each member below the top of the series in which it lies.

This table is adapted from the general sections of the measures as given by Reger in the preceding chapters of this report.

Table Showing Stratigraphic Position of Fossiliferous Members.

	Maximum intervals below top of each series, in feet.
Pennsylvanian System	
Monongahela Series (400 feet thick).	
Conemaugh Series (620 feet thick), containing:	
Orlando Limestone, shaly, lenticular, 2 feet thick; containing fish teeth; non-marine in origin........	260
Ames Limestone.	
Limestone, dark, shaly, lenticular; marine fossils abundant; 1 foot thick;	
Shale, dark green, bearing marine fossils, 10 feet thick;	
Limestone, dark, shaly, lenticular; abundant marine fossils, 1 foot thick...........................	323
Pine Creek Limestone, lenticular; sometimes containing marine fossils, 1 foot thick..................	460
Brush Creek Limestone.	
Limestone, dark; marine fossils abundant; 1 foot thick;	
Shale, dark; marine fossils abundant; 8 feet thick.	524

Allegheny Series (250 feet thick).	
Pottsville Series (1050 feet thick), composed of:	
Kanawha Group (645 feet thick), containing:	
Roof Shale of the Upper Mercer Coal, dark, bituminous, fissile; containing plant remains and invertebrate fossils; non-marine in origin; six inches thick................................	65
Kanawha Black Flint, shale, dark; with occasional marine fossils; 5 feet thick, absent in most places	135
Quakertown Shale, hard, black, fissile, carbonaceous, often fossiliferous; 4 feet thick, in places absent	217
Newlon Limestone and Shale, black, fissile shale, with limestone concretions; sometimes fossiliferous; non-marine in origin; 20 feet thick, absent in places....................................	576
New River Group (405 feet thick), containing:	
Hartridge Shale, black, fissile and carbonaceous; often fossiliferous; non-marine in origin; 2 to 5 feet in thickness..............................	895
Mississippian System	
Mauch Chunk Series (underlying formation).........	....

The correlation of the various stratigraphic units is the work of D. B. Reger. The fossiliferous beds were of great assistance as key rocks in the tracing of the strata. In the Pottsville the faunas below the Kanawha Black Flint are not sufficiently varied or distinct to be of assistance in the field, but the presence of *Lingula kanawhensis* in the Alton drill core at a depth approximately that of the Quakertown Shale and its having been found only at that horizon in the area of this report strengthened the correlation of the strata passed through in the drilling. A truly marine, though meagre, assemblage consisting of *Orbiculoidea convexa, Derbya crassa* and *D. robusta* was collected by Reger from beds which he, upon stratigraphic grounds, refers to the Kanawha Black Flint. Their presence strengthens this correlation.

The following section of the **Roof Shale of the Upper Mercer Coal** was measured by the writer at a point in Lewis County, Collins Settlement District, on the east bank of Cherry Fork of Little Kanawha River, 0.8 mile north of Ingo at 1245 feet above sea-level by aneroid. Locality 107; the beds are given in descending order:

	Beds		Totals	
	Ft.	In.	Ft.	In.
1. Sandstone, shaly	10	0	10	0
2. Shale, black, argillaceous, *Naiadites elongata,* aa; *Spirorbis pusillus,* a; Ostracoda, c; plant remains, c;.........	0	6	10	6
3. Coal, **Upper Mercer.** Bone........0 feet 6 inches Coal.........1 " 9 "	2	3	12	9
4. Shale, argillaceous, plant remains abundant	1	0	13	9
5. Coal, bone and shale.................	0	5	14	2
6. Shale, argillaceous; plant roots; sandy toward bottom; visible.............	5	0	19	2

This is the only locality at which fossils were obtained from the roof shale of the Upper Mercer Coal. The section at this point was given by Reger in the report on Lewis County*. The black shale from which the fossils were obtained lies above a small coal bed which was provisionally held to be the Mercer Coal. This correlation was, however, qualified in the following terms: "It is possible that this coal may be an intermediate seam between the Lower Kittanning and the Mercer, as its interval below the former seems too small." He has, in a previous chapter of the present report, referred it to the Upper Mercer.

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*West Virginia Geological Survey, 1916, Lewis County Rept. p. 170.

THE FAUNAS.

The Orlando Limestone of Reger* has furnished an interesting fauna collected from a small region in the southern projection of Lewis and the adjoining border areas of Braxton and Upshur. This fauna had been described as follows:**

"This fauna has not been studied in the laboratory. From notes made in the field while collecting, the following general description may be given: Fish teeth and scales are abundant and striking. They are of small size and frequently fragmentary. *Naiadites elongata* Dawson is found in association with pelecypoda suggestive of *Edmondia,* which latter have been examined only superficially. Ostracoda and plant remains complete an association of forms which strongly suggests a non-marine origin. The *Edmondia*-like pelecypoda may be marine types, and if so have probably been brought in by currents to a non-marine locality, or the inland forms have been carried out toward the sea." A single fish tooth was collected from this horizon in Upshur County.

Ames Limestone.—The following species have been obtained from this horizon:

Clionolithes canna
Derbya crassa
Chonetes granulifer
Productus sp. (immature individuals)
Nucula parva
Leda meekiana
Deltopecten occidentalis?
Euchondria neglecta
Euphemus carbonarius
Pharkidonotus percarinatus
Phanerotrema grayvillense

This assemblage by no means represents the whole of this fauna, being the yield of a very small amount of shale from a single collection. The species are, with two exceptions, common Ames forms. *Clionolithes canna* and *Euchon-*

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*Reger, D. B., West Virginia Geol. Survey, 1916, Lewis and Gilmer Cos. Rept., p. 147.

**Price, W. Armstrong, ibid, p. 623.

dria neglecta appear for the first time in a list of Ames fossils from West Virginia. Reger, who collected the fossils, is of the opinion that the Ames is less fossiliferous in this region than in the other Conemaugh areas of the state which have been studied by him and that it is less fossiliferous than the Brush Creek.

The Pine Creek Limestone in Upshur County has yielded the following species:

Derbya crassa?
Productus cora?
Composita subtilita
Solenomya anodontoides
Edmondia? sp.
Pelecypoda indeterminata.

These fossils were obtained from a single collection on the western border of the county which has been previously reported as follows:*

"On account of the fragmentary and comminuted condition of the shells only a few species were identified. Little can be said of the character of the fauna, except that an equal number of brachiopod and pelecypod species, and no other orders, appear, which is well in harmony with the general character of this fauna as observed elsewhere by the writer."

Further collections from this horizon in the area of the report have not been made nor the extension of the fossiliferous stratum determined.

Brush Creek Limestone.—This is the most abundantly fossiliferous horizon in the area of the report. Reger reports that its outcrops are numerous and that fossil collecting should yield excellent results. The material examined by the writer is in a better state of preservation than is frequently the case at this horizon, which is commonly a zone of water circulation in which the calcareous shells are leached out. The writer made two full collections from this horizon along the western edge of Upshur County and reported the list in connection with the survey of Lewis County, to which reference has been made on a previous page. Small amounts of material from other localities have come to hand, but a large number of species has been obtained from it due to the highly fossiliferous nature of the shale. The list follows:

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*West Virginia Geol. Survey, 1916, Lewis and Gilmer Counties Rept., p. 624.

Clionolithes canna
Serpulopsis insita
Enchostoma elkensis
Crinoidea, plates, spines and column-segments
Rhombopora lepidodendroides?
Chonetes granulifer
Chonetes verneuilanus
Productus cora
Pustula symmetrica?
Solenomya? anodontoides
Solenomya radiata
Prothyris elegans
Edmondia reflexa
Edmondia? sp., cf. concentrica
Edmondia sp.
Nucula parva
Leda meekiana
Yoldia glabra
Parallelodon obsoletus
Schizodus cuneatus?
Schizodus wheeleri?
Deltopecten coxanus
Euchondria neglecta
Lima retifera
Astartella concentrica
Plagioglypta meekiana?
Patellostium montfortianum
Bucanopsis meekiana
Pharkidonotus percarinatus
Phanerotrema grayvillense
Bulimorpha nitidula?
Gastropoda indeterminata
Pseudorthoceras knoxense?

Metacoceras sangamonensis
Ostracoda

An examination of the above list shows that of the 35 species one-half have been reported from the Brush Creek of Lewis and Gilmer Counties; of the remainder six were found in Preston County at this horizon. Ten species appear in Brush Creek lists for West Virginia for the first time. Two of these are tubicola: *Serpulopsis insita* and *Enchostoma elkensis.* The latter has previously been seen only in the Kanawha Black Flint. Six pelecypoda have formerly been found as follows: *Prothyris elegans* and *Edmondia concentrica* in the Ames; *Schizodus cuneatus* in the Seth Limestone; *Euchondria neglecta* in the Ames and Eagle limestones, while *Yoldia glabra* has not been reported from the state. One gastropod, *Bucanopsis meekiana,* is an Ames form and the remaining one of the ten species is the cephalopod *Metacoceras sangamonensis,* not previously noted in the state. The total number of species obtained is very nearly as great as that recorded for Lewis County; also the relative abundance of the species and those which have diagnostic value are, so far as may be determined from the few localities studied, very nearly the same as reported for that region.*

A striking feature of the material examined is the large number of minute individuals of the commoner species. These seem to form perhaps a half of the fossils present. Many species are here represented only by undersized examples.

Roof Shale of the Upper Mercer Coal.—This is the highest horizon referred to the Kanawha Group of the Pottsville in which fossils have so far been reported.

The fossils collected here by Reger and the writer are:

Spirorbis pusillus
Naiadites elongata
Ostracoda
Abundant plant remains.

This assemblage indicates non-marine conditions and there is nothing about the appearance of the plant remains to suggest any other mode of accumulation than growth in situ. A collection of the plants was not obtained; they appeared to be of the usual Coal Measures types.

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*West Virginia Geol. Survey, 1916, Lewis and Gilmer Counties Rept., p. 625.

Kanawha Black Flint. — A single small collection revealed:

Orbiculoidea convexa
Derbya crassa
Derbya robusta.

Reger reports the horizon only sparingly fossiliferous and frequently unrecognizable or absent.

The Quakertown Shale.—This horizon and the Kanawha Black Flint are the only ones at which undoubted marine fossils were found within the area of the report. Two species have been obtained from the collections:

Lingula kanawhensis
Naiadites elongata.

Of these the first-named was found at one outcrop of the shale and was also obtained from a drill core. The depth was only approximately determined but is known to be very nearly at the Quakertown horizon. Since this species was obtained nowhere else in the area it is referred with considerable confidence to this bed.

The Newlon Limestone and Shale.—At one locality *Naiadites elongata* was found in abundance. Since the habitat of this form appears quite varied, as is discussed elsewhere in this report, its presence fails to determine the conditions of deposition of the shale and its lime content. The bed has not been studied in the field by the writer.

The Hartridge Shale.—Four collections from this horizon have yielded abundant remains of *Naiadites elongata*. At one locality plant leaves were also abundant. This bed is the only member of the New River Group of the state from which fossil shells have been collected, the Douglas Shale of Wyoming and McDowell Counties having been found to lie above the base of the Kanawha Group.*

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*Ray V. Hennen, personal communication. He also reports having found Lingulae in shales associated with coals of the New River Group in Fayette County.

Range and Distribution of Fossils.

	Conemaugh Series.								Kanawha Group.								New River Group.			
	Orlando limestone.	Ames limestone.	Pine Creek limestone.	Brush Creek limestone.					Upper Mercer roof sh.	Kanawha Black Flint.		Quakertown shale.				Newlon ls. and sh.	Hartridge shale.			
	135	183	101	99	105	184	185	183	107	171	172	170	180	181	182	178	173	174	175	179
Clionolithes canna		c						c												
Spirorbis pusillus									c											
Serpulopsis insita						c														
Enchostoma elkensis				x																
Crinoidea, plates, spines, column-segments				x	a	aa		c												
Rhombopora lepidodendroides ?				x		c		c												
Lingula kanawhensis												c		a						
Orbiculoidea convexa											x									
Derbya crassa		c	?		?					x										
Derbya robusta											c									
Chonetes granulifer		a		a	aa	aa														
Chonetes verneuilanus				x	aa	aa		x												
Productus cora			?			x														
Productus sp. (immature individuals)		c																		
Pustula symmetrica						x		c												
Composita subtilita			x																	
Solenomva radiata				x																
Solenoyma? anodontoides			?		x															
Prothyris elegans						x		x												
Edmondia reflexa				?																
Edmonda ? sp., cf., concentrica								x												
Edmondia ? sp					x															
Nucula parva		c		x		x		c												
Leda meekiana		x		x	c	x		x												

Range and Distribution of Fossils (Continued).

	Conemaugh Series.								Kanawha Group.								New River Group.			
	Orlando limestone.	Ames limestone.	Pine Creek l'mestone.	Brush Creek limestone.					Upper Mercer roof sh.	Kanawha Black Flint.		Quakertown shale.				Newlon ls and sh.	Hartridge shale.			
	135	183	101	99	105	184	185	186	107	171	172	170	180	181	182	178	173	174	175	179
Yoldia glabra	...	...	...	...	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Paralleodon obsoletus	...	...	...	c	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Naiadites elongata	...	...	...	...	...	...	...	...	aa	...	...	a	x	...	x	a	a	a	x	c
Schizodus cuneatus ?	...	...	...	...	...	c	x	...	...	...	...	...	...	...	...	...	...	...	...	...
Schizodus wheeleri ?	...	...	...	...	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Deltopecten occidentalis	...	?	...	...	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Deltopecten coxanus	...	...	...	...	x	...	...	x	...	...	...	...	...	...	...	...	...	...	...	...
Euchondria neglecta	...	x	...	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lima retifera	...	...	...	...	...	...	...	x	...	...	...	...	...	...	...	...	...	...	...	..
Astartella concentrica	...	...	...	...	x	...	...	x	...	...	...	...	...	...	...	...	...	...	...	...
Plagioglypta meekiana ?	...	...	...	x	...	...	...	x	...	...	...	...	...	...	...	...	...	...	...	...
Patellostium montfortianum	...	...	...	...	x	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bucanopsis meekiana	...	...	...	x	...	c	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Euphemus carbonarius	...	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pharkidonotus percarinatus	...	x	...	...	...	a	...	x	...	...	...	...	...	...	...	...	...	...	...	...
Phanerotrema grayvillense	...	c	...	c	...	aa	...	c	...	...	...	...	...	...	...	...	...	...	...	...
Bulimorpha nitidula ?	...	...	...	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gastropoda indeterminata	...	...	...	...	...	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pseudorthoceras knoxense ?	...	...	...	...	x	...	...	x	...	...	...	...	...	...	...	...	...	...	...	...
Metacoceras sangmonensis	...	...	...	...	...	c	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ostracoda	...	...	...	...	...	...	...	aa	c	...	...	...	...	...	...	...	...	...	...	...
Pisces, tooth	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Plantae	...	...	...	...	...	...	...	...	c	...	...	...	...	...	...	...	c	...	...	...
Incertae sedis	...	...	...	...	...	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Register of Localities.

(An asterisk (*) denotes that the collection has been studied for this report.)

107. *Lewis County, Collins Settlement District, east bank of Cherry Fork of Little Kanawha River, 0.8 mile north of Ingo at 1245 feet above sea by aneroid; Kanawha Group, ROOF SHALE OF UPPER MERCER COAL. Collectors: W. Armstrong Price and D. B. Reger.

170. *Randolph County, Leadsville District, 0.3 mile south of Laurel Station on Western Maryland Railroad; Kanawha Group, QUAKERTOWN SHALE. Collectors: D. B. Reger and D. D. Teets.

171. *Barbour County, Glade District, head of Hunter Fork, 0.7 mile northwest of Thorn Knob; Kanawha Group, KANAWHA BLACK FLINT. Collector: D. B. Reger.

172. *Upshur County, Washington District, 0.7 mile southwest of Hemlock; Kanawha Group, KANAWHA BLACK FLINT. Collectors: D. B. Reger and D. D. Teets.

173. *Randolph County, Middle Fork District, at Hartridge on Left Fork of Buckhannon River; New River Group, HARTRIDGE SHALE. Collectors: D. B. Reger and D. D. Teets.

174. *Randolph County, Mingo District, head of Stony Run branch of Elkwater Fork of Tygart Valley River, 3.0 miles northwest of Monterville; New River Group, HARTRIDGE SHALE. Collector: D. B. Reger.

175. *Randolph County, Huttonsville District, H. G. Davis Mine on Mill Creek, 2.8 miles due west of Lee Bell; New River Group, HARTRIDGE SHALE. Collector: D. B. Reger.

178. *Randolph County, Middle Fork District, Right Fork of Buckhannon River, 0.8 mile southeast of Arvondale Junction; Kanawha Group, NEWLON MEMBER. Collector: D. B. Reger.

179. *Randolph County, Middle Fork District, Long Run, 2.8 miles southeast of Queen; New River Group, HARTRIDGE SHALE. Collector: D. B. Reger.

180. *Randolph County, Middle Fork District, drainage of Middle Fork River, on Bear Knob, 0.7 mile northwest of Cassity, Kanawha Group, QUAKERTOWN SHALE. Collector: D. B. Reger.

181. *Upshur County, Meade District, G. W. Fish drill core, on Big Run of Buckhannon River, 0.3 mile southwest of Alton. Kanawha Group, QUAKERTOWN SHALE. Collector: D. B. Reger.

182. *Barbour County, Philippi District, east bank of Tygart Valley River, 0.1 mile east of Adma Station, Kanawha Group, QUAKERTOWN SHALE. Collectors: Ray V. Hennen and D. B. Reger.

183. *Barbour County, Glade District, head of Teter Creek, 1.7 miles east of Flora; Conemaugh Series, AMES LIMESTONE. Collector: D. B. Reger.

184. *Upshur County, Banks District, 1.7 miles southwest of Rock Cave; Conemaugh Series, BRUSH CREEK LIMESTONE. Collector: D. B. Reger.

185. *Barbour County, Barker District, 0.5 mile northwest of Tygheview; Conemaugh Series, BRUSH CREEK LIMESTONE. Collector: D. B. Reger.

186. *Barbour County, Valley District, about 2 miles southwest of Dartmoor (locality not definitely reported); Conemaugh Series, BRUSH CREEK LIMESTONE. Collector: D. D. Teets.

For convenience of reference the following list of localities in Upshur County is quoted from the report on Lewis and Gilmer Counties. The fossils obtained at these localities were included in the lists published in that report and have been studied and described herein.

99. *Upshur County, Banks District, Coal & Coke Railway cuts, 1.1 to 1.3 miles east of Jewell, 1397 feet barometer above sea, BRUSH CREEK LIMESTONE.. Collector, W. Armstrong Price.
101. *Upshur County, Buckhannon District, Right Fork of Stonecoal Creek, south bank of stream, 1.1 miles southwest of Atlas, 1170 feet barometer above sea, PINE CREEK LIMESTONE.. Collector, W. Armstrong Price.
105. *Upshur County, Banks District, head of Whites Camp Fork of West Fork River, 0.7 mile northwest of Cow Run School 1620 feet barometer above sea, BRUSH CREEK LIMESTONE.. Collector, W. Armstrong Price.
135. *Upshur County, Buckhannon District, 0.4 mile southwest of Atlas, on head of Spruce Fork of Stonecoal Creek, in public road, 1370 feet barometer above sea, ORLANDO LIMESTONE. Collector, D. B. Reger.

DESCRIPTION OF SPECIES.

(The following abbreviations are used in the description: "a", abundant; "aa", very abundant; "c", common; where no symbol follows the locality number the species is rare in the collection obtained. All the specimens of these collections are in the Collection of the West Virginia Geological Survey.)

COELENTERATA.

PORIFERA.

Genus CLIONOLITHES Clarke.

Clionolithes canna Price.

Clionolithes canna. Price, 1916, West Virginia Geol. Survey, Raleigh and Western Por. Summers and Mercer Cos. Rept., p. 688, pl. xxx, fig. 1.

Conemaugh Series: Brush Creek limestone, Preston County, West Virginia.

Kanawha Group: Winifrede limestone, Raleigh County, West Virginia.

Description.—Casts of fine, branching and anastomosing tubules similar to those upon which the species was based. The mat of tubules occupies the cavity formed by the leaching of thin shells whose affinities I am not able to ascertain. The tubules evidently were not raised upon the surface of the shell but were completely buried within the shell substance and communicated at their ends with the surface.

Occurrence.—Conemaugh Series, AMES LIMESTONE, Barbour County, Locality 183 (c); BRUSH CREEK LIMESTONE, Barbour County, Locality 186 (c).

VERMES.

CHAETOPODA.

Genus SERPULOPSIS Girty.

Serpulopsis insita (White).

Serpula insita. White, 1878, Acad. Nat. Sci. Philadelphia, Proc., p. 37. Coal Measures: Newport, Vermillion County, Indiana.

Serpula insita. White 1880, U. S. Geol. and Geog. Survey Terr. (Extract 12th Ann. Rept. for 1878), Contr. Inv. Pal., No. 8, p. 171, pl. xlii, fig 8a. Coal Measures: Newport, Vermillion County, Indiana.

Description.—On shells of *Chonetes* and *Metacoceras sangamonensis?* very minute tubes are found which apparently differ from those illustrated by White and Girty in no way, unless it be in size. Our tubes are extremely minute, being in diameter only one-half or one-fourth the size of those cited above. From Girty's statement* that his "specimens show considerable variation in point of size" it is supposed that there is no specific difference between his specimens and ours.

Occurrence.—Conemaugh Series, BRUSH CREEK LIMESTONE, Upshur County, Locality 184 (c).

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*U. S. Geol. Survey, 1915, Bull. 544, p. 41.

MOLLUSCOIDEA.

BRACHIOPODA.

Genus LINGULA Bruguière.

Lingula kanawhensis Price.

Plate xliv; Figures 1, 1a.

Lingula kanawhensis. **Price, 1914, West Virginia Geol. Survey, Kanawha County Rept., p. 647 (p. 9 of reprint), pl. i (of pt. iv), figs. 5, 6.**
Kanawha Group: Queen Shoals, Kanawha County, West Virginia.

Description.—Shells smaller than the type specimens but having the typical subquadrate form and subtruncate anterior margin. The posterior margin slopes more abruptly away from the beak than in the case of the type specimens. This feature appears, from a study of available collections, to be variable.

Measurements:—Length, 13 mm.; breadth, 8 mm.

Occurrence.—Kanawha Group, QUAKERTOWN SHALE, Randolph County, Locality 170 (c); Upshur County, Locality 181 (a).

Genus CHONETES Fischer de Waldheim.

Chonetes granulifer Owen.

Chonetes granulifera. **Owen, 1852, Geol. Surv. Wisconsin, Iowa and Minnesota, Rept., p. 583, pl. v. fig. 12.**
Carboniferous limestone: Near mouth of Keg Creek.

Description.—Small representatives of this species, all with less than 11 mm. length of hinge line. They grade by insensible stages into *C. verneuilanus* which is more abundant than forms clearly lacking the median sinus and belonging to *C. granulifer.* Immature shells of sub-microscopic size belonging to these two species are as numerous in the collections as mature shells. It is seldom that it is possible to determine to which species they belong.

Occurrence.—Conemaugh Series, AMES LIMESTONE. Barbour County, Locality 183 (a); BRUSH CREEK LIMESTONE, Upshur County, Localities 99 (a), 105 (aa), and 184 (aa).

Genus PRODUCTUS Sowerby.

Productus cora d'Orbigny.

Productus cora. **D' Orbigny, 1842, Voyage dans l'Amérique Méridionale, vol. iii, pt. iv. p. 55.**
Carboniferous: Above Patapatoni, on an island in Lake Titicaca; Yarbichambi.

Description.—A single specimen of this well-known species shows a size unusually large for this region.

Length (exclusive of the produced front margin, which is lacking), 50 mm.; width, 60 mm.; thickness of crushed shell, 30 mm.

Occurrence.—Conemaugh Series, PINE CREEK LIMESTONE, Upshur County, Locality 101 (?); BRUSH CREEK LIMESTONE, Upshur County, Locality 184.

MOLLUSCA.

PELECYPODA.

Genus YOLDIA Möller.

Yoldia glabra Beede and Rogers.

Yoldia glabra. **Beede and Rogers, 1899, Kansas Univ. Quart., vol. viii, No. 3, p. 133, pl. 34, figs. 4a, b.**
Coal Measures: Camerons Bluff, near Lawrence, Kansas.

Description.—A small shell following closely the description of this species given by Girty*. It was overlooked among shells referred to *Leda meekana*† in a former report.

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*U. S. Geol. Survey, 1915, Bull. 544, p. 126, Pl. xiii. figs. 9 to 15.

†West Virginia Geol. Survey, Lewis and Gilmer Cos. Rept., 1916. p. 627.

Occurrence.—Conemaugh Series, BRUSH CREEK LIMESTONE, Upshur County, Locality 105.

Genus PARALLELODON Meek.

Parallelodon obsoletus (Meek).

Macrodon obsoletus. **Meek, 1871, 3rd Ann. Rept., Regents West Virginia Univ. for 1870, "b", p. 71, (p. 5 of reprint).**
Coal Measures: Just below "Mahoning" sandstone (Brush Creek limestone).
Macrodon obsoletus. **Meek, 1875, Geol. Surv. Ohio, pal., vol. ii, p. 334, pl. xix, fig. 9.**
Coal Measures: Newark, Ohio.

Description.—Minute examples of the species measuring 2 mm., 4 mm. and 5 (plus) mm. in length.

Occurrence.—Conemaugh Series, BRUSH CREEK LIMESTONE, Upshur County, Locality 99 (c).

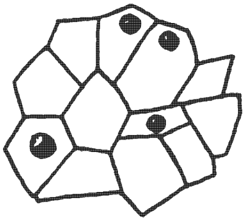

Figure 22.—Showing detail of surface of *Naiadites elongata,* enlarged approximately 250 diameters. From Quakertown Shale, Randolph County, Locality 170.

Genus NAIADITES Dawson.

Naiadites elongata Dawson.

Plate xliv; Figures 2-2d; Text figure 22, p. 794.

Naiadites elongata. **Dawson, 1860, Acadian Geology, Suppl., p. 43. Coal Measures: Joggins, Nova Scotia.**

Naiadites (Anthracomya) elongata. **Dawson, 1868, Acadian Geol., 2nd ed., p. 204, text fig. 43. Middle Coal Measures: Joggins and Sidney, Nova Scotia.**

Description.—The oblique form, minute, anterior beaks, thin shell, fine, concentric growth lines and variable proportions characterize this species. It is most often found, in the area of this report, and in other areas in West Virginia, in fissile shales. Often large numbers of the valves are found in close association and in the fissile shales the shell is uniformly crushed, wrinkled and flattened. In this condition, especially when the surface markings are obscured, it bears much resemblance to similarly crushed and wrinkled lingulas with species of which it is sometimes associated.

An examination of the surface of the shell when well-preserved shows it to be divided into polygons of microscopic proportions arranged roughly in rows parallel to the growth lines or without linear arrangement. The polygons are four, five and six-sided, fitting together in the form of a mosaic. On the posterior portions of the shell they reach a size of approximately 1-25 mm. diameter. Anteriorly they become gradually smaller until at the beaks they are scarcely to be distinguished when using a magnification of 60 diameters. The surface of each polygon appears to be dotted with minute granules. In the center of many polygons is a raised pustule. The lines of growth cross these polygons without regard to their boundary lines; the latter are very slightly depressed sutures which are the lines of junction of polygonal blocks of which the shell is entirely composed. The edges of these blocks, when separated from the shell, have a transversely fibrous appearance. Thickness of the blocks (and of the shell), about one-seventy fifth mm. Of the supposed fibrous structure and granular surface

I can not be positive. The other surface features described are distinct.

The habitat of shells referred to this species which have come under my observation shows either adaptability to a wide range of conditions from fresh bog waters to shallow sea bottoms; or transportation in large numbers into marine water after the death of the animal without marked breakage of the delicate shells and without evidence of having been floated on plant remains; or a habitat in basins cut off from the sea by low bars along a coast where high storm waters or occasional high tides washed the shells of open-sea animals into the basin of fresh water. A fourth possibility is that more than one species is represented by the shells which have been referred to *elongata*. Although the proportions are variable, these variations are often to be found among shells lying adjacent to each other and no method of distinguishing separate species among the specimens collected has been found.

This species is usually associated with plant leaves, stems, and wood, fish scales and teeth, ostracoda, and tubes of *Spirorbis pusillus*, with, occasionally, indistinct remains of gastropoda and pelecypoda not referable to any of the known marine forms of the region. This would seem to constitute a fresh, or possibly brackish water assemblage, though the plants show no evidences of transportation. It has been found associated with *Lingula kanawhensis* with no other organism present; with *Chonetes granulifer* alone; with Lingula, Deltopecten and plant remains; with an abundant marine fauna consisting of common brachipoda, pelecypoda and other forms; or in fine-grained shales entirely alone. In some cases marine horizons when traced in certain directions lose their typically marine fossils and *Naiadites elongata* appears as the only fossil present.

Occurrence.—Kanawha Group, KANAWHA BLACK FLINT, Lewis County, Locality 107 (aa); QUAKERTOWN SHALE, Randolph County, Localities 170 (a), 180, Barbour County, Locality 182; NEWLON MEMBER, Randolph County, Locality 178 (a); New River Group, HARTRIDGE SHALE, Randolph County, Localities 173 (a), 174 (a), 175, 179 (c).

Genus SCHIZODUS King.

Schizodus cuneatus Meek?

Plate xliv, Figures 4, 4a.

Schizodus cuneatus. Meek, 1875, Geol. Surv. Ohio, vol. ii, Pal., p. 336, pl. xx, fig. 7.
Lower Coal Measures: Putnam Hill and Flint Ridge, Ohio.

Description.—Three fragmentary shells of the form which I have been referring to this species. When compared with Meek's drawing the beak is seen to be less high and the central and umbonal regions perhaps less markedly triangular in outline. If more perfect material were at hand the shells would probably be referred to some other species.

Occurrence.—Conemaugh Series, BRUSH CREEK LIMESTONE, Upshur and Barbour Counties, Localities 184 (c), 185.

Schizodus wheeleri (Swallow)?

Plate xliv, Figure 5.

Cypricardia (?) Wheeleri. Swallow, 1863, St. Louis Acad. Sci., Trans. vol. ii, p. 96.
Upper Coal Measures: Caldwell County, Missouri.
Schizodus Wheeleri. Meek, 1872, U. S. Geol. Survey of Nebraska. Final Rept., p. 209, pl. 10, figs. 1a-f.
Upper Coal Measures: Caldwell County, Missouri; Nebraska.

Description.—This is a very doubtful identification. The single specimen is badly crushed and the margin is broken away so that the outline can not be determined with certainty.

Occurrence.—Conemaugh Series, BRUSH CREEK LIMESTONE, Upshur County, Locality 105.

Genus DELTOPECTEN Etheridge.

Deltopecten coxanus (Meek and Worthen).

Plate xliv, Figure 3.

Aviculopecten Coxanus. **Meek and Worthen, 1860, Acad. Nat. Sci., Philadelphia, Proc., p. 435.**
Coal Measures: Adams County, Illinois.
Aviculopecten Coxanus. **Meek and Worthen, 1866, Illinois Geol. Survey, vol. ii, p. 326, pl. xxvi, figs. 6a, b.**
Lower Coal Measures: Adams County, Illinois.

Description.—The cast of a left valve of this little species agrees in all particulars with Meek's description of his species and particularly with the description of his Nebraska specimen*, being somewhat oblique, but slightly smaller than his specimen. Other casts less perfect in preservation are also referred to this species.

Dimensions: Height, 6 mm.; length, 6 mm.; cardinal line, 6 mm.; greatest width below cardinal line, 5 mm.; number of costæ, 25, of which 13 are distinctly inferior in size to the remainder.

The cast of the interior of the shell is smooth with a few faint radiating lines.

From three horizons of the Conemaugh of Preston County, the Ames, Pine Creek and Brush Creek limestones**, this species has been obtained. They were at first identified as immature examples of *D. occidentalis****. I am not able to satisfy myself, from the material at hand, that I can distinguish equal-sized individuals of the two species from each other. Because of the difference in size between the adults of the two species and because at many localities only the much smaller shells are to be found it is convenient to consider the two sizes as separate species. In Preston County the larger species is found associated with the smaller in both the Ames and Pine Creek limestones†. The Preston County examples of *D. coxanus* show that the radiating ribs of the exterior surface were sharply defined upon the interior of the shell as grooves.

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*U. S. Geol. Surv., Nebraska, Final Rept., 1872, p. 196, pl. ix, fig. 2a, b.

**Localities 7, 14 15, 16, 23, 27, 30 and 33.

***West Virginia Geol. Survey, Rept. on Preston Co., 1914, p. 525.

†Localities 14, 23 and 30.

Occurrence.—Conemaugh Series, BRUSH CREEK LIMESTONE, Upshur and Barbour Counties, Localities 105 and 186.

Genus EUCHONDRIA Meek.

Euchondria neglecta (Geinitz)?

Pecten neglectus. **Geinitz, 1866, Carb. und Dyas in Nebraska, p. 33, pl. ii, fig. 17.**
Nebraska City, Nebraska.

Description.—A poor cast resembling Geinitz's species but possibly having the hinge line equal to or a little greater than the greatest width of the shell below.

Occurrence.—Conemaugh Series, AMES LIMESTONE, Barbour County, Locality 183; BRUSH CREEK LIMESTONE, Upshur County, Locality 99.

SCAPHOPODA.

Genus PLAGIOGLYPTA Pilsbury and Sharp.

Plagioglypta meekiana (Geinitz)?

Dentalium Meekianum. **Geinitz, 1866, Carb. und Dyas in Nebraska, p. 13, pl. i, fig. 20.**
Nebraska City, Nebraska.

Description.—A cast of a fragment of a small cylindrical cone 7 mm. in length resembles this species in those features which I have been able to decipher. The transverse striæ number from 9 to 23 in the space of 1 mm., becoming extremely fine near the apex. Whether the striæ are revolving or annular it is not possible to ascertain. Geinitz's illustration shows, in addition to the striæ, which he terms growth lines

("Anwachsstreifen"), prominent lines of growth more deeply impressed than the striæ. He does not mention the latter in his description and they are apparently absent upon my specimen. Since there is only the one specimen in my collection I am not able to determine whether the absence of these lines of growth should be made the basis of a separate species.

Upon opposite sides of the mold of the interior of the shell two fine, elevated, longitudinal carinæ are seen which denote corresponding fissures in the interior of the shell. These fissures appear not to have passed entirely through the shell and are not seen upon the cast of its exterior. They were probably developed by pressure, as they are continuous in that portion of the shell which shows a flattened, slightly elliptical cross-section. The smaller end has a circular cross-section and here there are no fissures. Similar fissuring has been previously reported in a shell which is probably the same species*.

Occurrence.—Conemaugh Series, BRUSH CREEK LIMESTONE, Barbour County, Locality 186; Upshur County, Locality 99.

GASTROPODA.

Genus BUCANOPSIS Ulrich.

Bucanopsis meekiana (Swallow).

Bellerophon Meekianus. Swallow, 1858, St. Louis Acad. Sci, Trans., vol. i, p. 204. (Date of imprint, 1860).
Middle Coal Measures: Lexington, Missouri.

Bucanopsis meekiana. Girty, 1915, U. S. Geol Survey, Bull. 544, p. 169, pl. xx, figs. 4-6.
Wewoka formation: Wewoka and Coalgate quadrangles, Oklahoma.

Description.—A few fragments of gastropod shells show unmistakably the sculpture of this little species. This is the species which I have formerly known as *B. perlata* Conrad† but Gurley's remarks about Conrad's specimen, quoted by Girty, with Girty's description of *B.* ***meekiana*** show the error of the former identification.

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*West Virginia Geological Survey, 1916, Report on Raleigh and Western Por. Summers and Mercer Cos., p. 726.

†West Virginia Geol. Survey, 1914, Rept. Preston Co., p. 534.

Occurrence.—Conemaugh Series, BRUSH CREEK LIMESTONE, Upshur County, Localities 99 and 184 (c).

Gastropoda indeterminata.

Description.—Two fragments of a microscopic shell somewhat resembling in proportions shells of Aclisina. Three volutions of a microscopic, turreted, high-spired shell in a height of 1¼ mm.; diameter of whorls, about ½ mm.; whorls rounded, cylindrical; suture deep; surface apparently smooth, the shell worn through, exposing the shell-filling. This tiny shell is embedded in the shell-filling of *Metacoceras sangamonensis.*

Occurrence.—Conemaugh Series, BRUSH CREEK LIMESTONE, Upshur County, Locality 184.

CEPHALOPODA.

Genus METACOCERAS Hayatt.

Metacoceras sangamonensis (Meek and Worthen)?

Plate xliv, Figure 6.

Nautilus (Discus) Sangamonensis. **Meek and Worthen, 1860, Acad. Nat. Sci. Philadelphia, Proc., p. 470**
Coal Measures: Sangamon County, Illinois.

Nautilus sangamonensis. **Meek and Worthen, 1866, Geo. Surv. Ill., vol. ii, p. 386, pl. 29, figs. 3a, b.**
Upper Coal Measures: Sangamon County, Illinois.

Description.—This is a crushed fragment of a volution of a discoidal shell and I am unable to determine the generic relationship with certainty. The umbilical shoulders are well developed and the shell seems to contract from them to the ventro-lateral shoulders. The height and width are subequal. The sides of the volutions are distinctly concave on the earlier portion of the whorl, but crushing has obscured the contour of the more enlarged portions. The umbilical shoulders have an abrupt angulation of 90 degrees. If the cross-section has been correctly inferred this shell is a Metacoceras and seems to agree in all distinguishable features with *M. sangamonensis*. The surface sculpture is well exhibited on the venter, where it consists of fine striæ, following the lines of growth. The striæ are all of the same order of magnitude, but vary slightly in strength of impression, groups of finer lines alternating somewhat irregularly with coarser striæ, giving the surface an undulating appearance on a minute scale. On the umbilical angulation the striæ are more regular, with raised liræ between them. Over the lateral surfaces is spread a thin structureless coating, similar to that found upon *M. sculptile* as described by Girty*. On the venter the striæ form a deep sinus and, upon all parts of the shell where their courses may be determined, they are arranged like those of *M. sculptile*.

Measurements: Half-width of venter near wider end, 15 mm.; hence: calculated width of venter, 30 mm.; height at this point, 25 mm.; umbilicus, 25 mm. in diameter.

On the venter, where the surface of the shell is exposed beneath the thin superficial coating, it is finely dotted with minute, circular pits arranged in lines, usually sunken in the liræ, but sometimes not coinciding with them in direction. When excavated in the crests of the liræ, the pits appear to connect by domed subways beneath the shell under the arched liræ. The origin of these pits is not understood. Eight of the pits were counted in a line 2 mm. long. The pits are about 1/6 mm. in diameter. Upon the surface of the shell and partly sunken in it is a short length of a single tube of *Serpulopsis insita*. In the shale filling the interior is a tiny coiled gastropod shell of undetermined affinities.

Occurrence.—Conemaugh Series, BRUSH CREEK LIMESTONE, Upshur County, Locality 184 (c).

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*U. S. Geol. Survey, Bull No. 544, 1915, p. 246.

Incertæ sedis.

Description.—A minute, circular coil, about ⅓ mm. in diameter, consisting of three distinct volutions which merge inward, the suture lines becoming indistinct, so that the central portion appears as a smooth, calcareous disc, white in color. Shell apparently very thin. It has somewhat the appearance of being a coiled tube, the mouth of which is partly buried in the matrix, but the structure which resembles a mouth may be a down-folding due to crushing and the test may be merely a paper-thin sheet. The latter interpretation appears to be the true one. Whether it is the upper portion of a thin shell or an exfoliation from a shell is uncertain.

Occurrence.—Conemaugh Series, BRUSH CREEK LIMESTONE, Upshur County, Locality 184.

DESCRIPTION OF PLATE.

PLATE XLIV.

Figs. 1, 1a. *Lingula kanawhensis* Price............x 1 792

1. **Natural mold of interior with portions of the test adhering.**

1a. **Natural mold of exterior of the same shell with portions of the test adhering; Quakertown Shale, Upshur County, Locality 181.**

Figs. 2 to 2d. *Naiadites elongata* Dawson..........x 1 795

Flattened and distorted valves showing common condition of preservation.

2. **Quakertown Shale, Randolph County, Locality 170.**

2a and 2b. **Roof shale of Upper Mercer coal, Lewis County, Locality 107.**

2c. **Immature individual, Hartridge Shale, Randolph County, Locality 173.**

2d. **A mold of a coiled tube of *Spirorbis pusillus* in the shell of *Naiadites elongata*, Roof Shale of Upper Mercer coal, Lewis County, Locality 107.**

Fig. 3. *Deltopecten coxanus* (Meek and Worthen)..x 1 798

From an artificial cast of a mold of the exterior of a left valve.

Brush Creek Limestone, Barbour County, Locality 186.

Figs. 4, 4a. *Schizodus cuneatus* Meek?............x 1 797

4. **A left valve with a portion of the shell broken away exposing the cast in the matrix; surface worn.**

4a. **A right valve, surface partly concealed by a thin coating of a dark material. Brush Creek Limestone, Upshur County, Locality 184.**

Fig. 5. *Schizodus wheeleri* Swallow?.............x 1 797

A left valve, crushed and having a portion of the basal region of the shell missing. Brush Creek Limestone, Upshur County, Locality 105.

Fig. 6. *Metacoceras sangamonensis* (Meek and Worthen) ....x 1 801

A portion of a coil, with nodes somewhat damaged and sculpture hidden by a thin coating of a dark material. In the matrix exposed on the ventro-lateral shoulder where a portion of the shell and one node have been broken away is a minute gastropod shell scarcely visible upon the reproduction. (*Gastropoda indeterminata*, p. 801.) Brush Creek Limestone, Upshur County, Locality 184.

WEST VIRGINIA GEOLOGICAL SURVEY PLATE XLIV

2

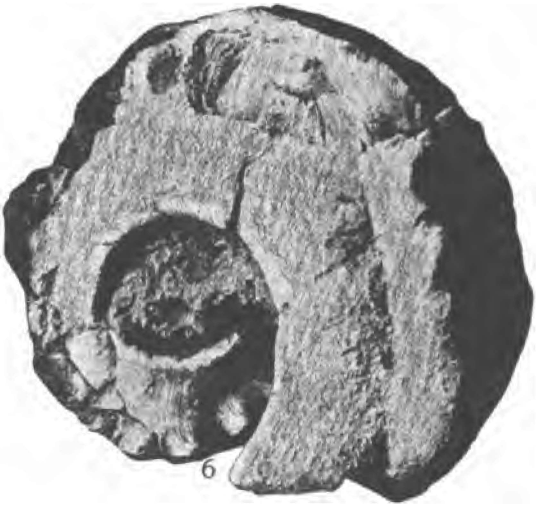
2a

2b

1

2c

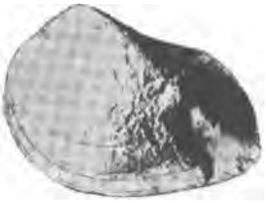
1a

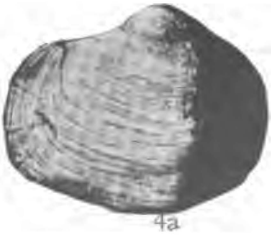

6

2d

5

3


4


4a

W. A. Price and J. Grantham, dels.

CONEMAUGH AND POTTSVILLE FOSSILS.

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APPENDIX.

LEVELS ABOVE MEAN TIDE.

RAILROAD LEVELS.

(As furnished by Chief Engineers of the various railroads, and published in Bulletin 2 of the West Virginia Geological Survey in 1911).

Pickens Branch of Baltimore & Ohio Railroad.

Distance from Macpelah Jct.	Stations.	County	Elevation
0.0	Macpelah Junction	Lewis	1022
11.3	Lorentz	Upshur	1446
15.5	Buckhannon	Upshur	1411
20.8	Hampton	Upshur	1429
23.2	Sago	Upshur	1435
28.2	Tenmile	Upshur	1620
33.5	Alton	Upshur	1810
37.1	Alexander	Upshur	1849
40.8	Newlon	Upshur	1912
43.2	Craddock	Upshur	2061
45.3	Arvondale Junction	Randolph	2260
46.8	Silica	Randolph	2341
50.2	Pickens	Randolph	2697

Grafton & Belington Branch of Baltimore & Ohio Railroad.

Distance from Grafton.	Stations.	County	Elevation
0.0	Grafton (old station)	Taylor	999.85
8.8	Sandy	Barbour	1035.6
10.2	Lush	Barbour	1068.0
11.0	Cove Run	Barbour	1088.0
14.0	Moatsville	Barbour	1169.1
17.7	Arden	Barbour	1270.9
18.9	Felton	Barbour	1302.6
20.2	Foxhall	Barbour	1296.6
21.7	Berryburg Junction	Barbour	1302.1
22.8	Meriden	Barbour	1301.6
24.3	Philippi	Barbour	1299.6
28.2	Lillian	Barbour	1319.0
29.7	Tygart Junction	Barbour	1332.3
32.4	Adma	Barbour	1451.1
34.6	O'Brien	Barbour	1534.0
35.6	Clements	Barbour	1580.9
37.9	Wilmoth	Barbour	1669.4
39.4	McLean	Barbour	1692.5
41.3	Belington	Barbour	1701.6

Berryburg Branch of Baltimore & Ohio Railroad.

Distance from Berryburg Jct.	Stations.	County	Elevation
0.0	Berryburg Junction	Barbour	1302.1
0.7	Boylon	Barbour	1302.1
2.8	Scale House	Barbour	1371.8
3.8	Berryburg	Barbour	1372.1

Point Pleasant, Buckhannon & Tygart Valley Branch of Baltimore & Ohio R. R.

Distance from Tygart Junction.	Stations.	County	Elevation
0.0	Tygart Junction	Barbour	1332.3
0.9	Malta	Barbour	1357.3
4.1	Century Junction	Barbour	1377.3
5.2	Hannan	Barbour	1385.0
6.7	Hall	Barbour	1395.0
8.3	Murphy	Barbour	1400.0
10.9	Pecks Run	Upshur	1460.0
11.4	Smith Summit	Upshur	1461.8
13.7	Post Mill	Upshur	1422.5
16.6	Buckhannon	Upshur	1411.0

Burnersville Branch of Baltimore & Ohio Railroad.

Distance from Century Junction.	Stations.	County	Elevation
0.0	Century Junction	Barbour	1377.3
1.3	Volga	Barbour	1402.0
4.8	Century	Barbour	1466.2

Coal and Coke Railway.

Distance from Charleston.	Stations.	County	Elevation
0.0	Charleston	Kanawha	597
129.2	Crawford	Lewis	1104
133.9	Frenchton Tunnel No. 9	Lewis	1402
135.1	Frenchton	Upshur	1499
136.2	Phillips Tunnel No. 8	Upshur	1537
138.2	Abbott Tunnel No. 7	Upshur	1527
138.6	Abbott	Upshur	1497
141.3	Adrian	Upshur	1432
143.8	Sago Tunnel No. 6	Upshur	1505
144.3	Sago	Upshur	1469
145.7	Nixon	Upshur	1530
147.5	Strader	Upshur	1679
149.0	Reed Tunnel No. 5	Upshur	1767
149.3	Goodwin	Upshur	1762
149.8	Shipman Tunnel No. 4	Upshur	1791
151.9	Sand Run	Upshur	1962
152.2	Groves Tunnel No. 3	Upshur	1991

Coal and Coke Railway (Continued).

154.7	Midvale	Randolph	1862
155.9	Lantz	Randolph	1887
157.9	Orr	Randolph	2057
158.0	Orr Tunnel No. 2	Randolph	2081
159.4	Kingsville Tunnel No. 1	Randolph	2181
159.5	Kingsville	Randolph	2167
162.5	Loop	Randolph	2022
166.0	Leiter	Randolph	1837
167.5	Roaring Creek Junction	Randolph	1867
171.8	*Coalton	Randolph	2157
174.5	Belington	Barbour	1698
175.2	†Elkins	Randolph	1930

*B. M. on southeast corner of Company store.

†B. M. on top stop of Western Maryland Railway office building.

Main Line, Western Maryland Railway.

Distance from Baltimore.	Stations	County	Elevation
0.0	Baltimore, Md. (Hillen Station)	Baltimore	23
274.4	Elkins	Randolph	1933
275.9	Elkins Junction	Randolph	1933
276.8	Buxton	Randolph	1929
282.3	Roaring Creek Junction	Randolph	1868
282.7	Harding	Randolph	1854
285.8	Laurel	Barbour	1761
288.4	Junior	Barbour	1731
289.9	Dartmoor	Barbour	1724
292.3	Belington	Barbour	1706

Weaver Branch, Western Maryland Railway.

Distance from Baltimore.	Stations.	County	Elevation
292.3	Belington	Barbour	1706
295.8	Harts Summit	Barbour	2023
298.2	Weaver	Randolph	1938

Alexander and Eastern Railroad.

Distance from Alexander.	Stations.	County	Elevation
0	Alexander	Upshur	1690
5	Palace Valley	Upshur	1930
6	Camp Creek	Randolph	2000
8	Star	Randolph	2115
10	Beech Run	Randolph	2260
14	Tenneys (Hartridge)	Randolph	2400
15	"Y"	Randolph	2500
17	Junction	Randolph	2550
17¼	End of Line (1908)	Randolph	2565

U. S. GEOLOGICAL SURVEY† LEVELS.

BELINGTON QUADRANGLE.

From Moore Station along Western Maryland R. R. to Kerens (spur line, checked).

Feet.

Montrose, 0.2 mile northeast of station in second step from top of coping-stone of northeast wing-wall of railroad bridge; bronze tablet stamped "1997 Adj 1903"..........1,996.424

Kerens, 350 feet south of station; top of rail................1,945.8

Kerens, 350 feet south of station, in southwest bridge seat of iron bridge; bronze tablet stamped "1944 Adj 1903"...1,943.618

From Montrose west along public road.

Montrose, 1.5 miles east of, in foundation stone of east end of Mathias Skidmore's residence; aluminum tablet stamped "2049 Adj 1903"...............................2,048.840

From Hannahsville west along public roads via Valley Furnace to Arden, thence southwest to Philippi.

Valley Furnace, 5.5 miles northeast of, near head of Licking Creek, south side of road near crossing, in large rock; bronze tablet stamped "2398 Adj 1903".................2,397.060

Valley Furnace, 0.7 mile west of, on side of road, in large rock; bronze tablet stamped "1462 Adj 1903"...........1,461.146

Nestorville, 1 mile northeast of, on Teter Creek, on farm owned by A. J. Bigman, in large rock on north side of road; bronze tablet stamped "1328 Adj 1903"...........1,327.211

Moatsville (Nicklow Post-Office), southwest abutment of Baltimore & Ohio R. R. bridge over mouth of Teter Creek; bronze tablet stamped "1167 Adj 1903"..................1,166.280

Arden, 75 yards southwest of, near railroad, in large rock; bronze tablet stamped "1275 Adj 1903"................1,274.297

From Valley Furnace along public roads to Sinclair.

Kasson, post-office (Danville), 1.5 miles east of, at forks of road, east side of road, in large rock; aluminum tablet stamped "1634 Adj 1903"............................1,633.623

Colebank, 0.1 mile south of, between church and planing mill, east side of road, in large rock; bronze tablet stamped "1468 Adj 1903".......................................1,467.789

From Nestorville south along public roads to Belington.

Nestorville, southwest corner of north abutment of iron bridge over Teter Creek; bronze tablet stamped "1372 Adj. 1903" 1,371.506

Kalamazoo, 0.5 mile north of, on east side of road, in top of outcrop of rock; bronze tablet stamped "1598 Adj 1903"....1,597.408

Meadowville, southwest corner of cut sandstone foundation of residence of J. D. Holesberry; aluminum tablet stamped "1569 Adj 1903"....................................1,568.761

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†From Bulletin 632, U. S. Geological Survey; 1916.

	Feet.
Flora, 0.3 mile south of, on west side of road, opposite Mr. Goodwin's residence, in large rock; bronze tablet stamped "1585 Adj. 1903"	1,584.614
Belington, in base rock of cut-stone foundation of Citizens National Bank; aluminum tablet stamped "1698 Adj 1903"	1,698.071

CRAWFORD QUADRANGLE.

From Brownsville south along Baltimore & Ohio R. R. to Arnold.

Rohrbough, in front of station; top of rail	1,036.2
Roanoke, 0.4 mile north of, on southeast corner of north abutment of iron bridge over Canoe Run; chiseled square	1,047.95
Roanoke, 1.8 miles southwest of, 0.6 mile northeast of Arnold, in southwest corner of southwest pier of railroad bridge No. 38B over Monongahela, (West Fork) River; bronze tablet stamped "1,058 Grafton"	1,057.670

From Sago west along Coal & Coke R. R. to Jacksonville, thence along highway to Arnold Station (Baltimore & Ohio R. R.)

Sago, 1.7 miles west of, 10 feet south of track, on large boulder; chiseled square, marked "1442"	1,441.31
Adrian, in front of station; top of clearance-post, marked "1426"	1,426.09
Adrian, 0.5 mile west of, 150 feet west of crossing, 100 feet north of wagon road, 6 feet north of track, in rock ledge; bronze tablet stamped "1432"	1,431.280
Adrian, 2.3 miles west of, 30 feet north of track, in cut; chiseled square on large boulder; marked "1481"	1,480.61
Abbott, in front of station; top of rail	1,493.70
Abbott, 0.3 mile west of, south side of entrance to tunnel, in brick wall; bronze tablet stamped "1523"	1,522.678
Abbott, 1.6 miles west of, on south end of west abutment of railroad bridge; chiseled square, marked "1472"	1,471.76
Abbott, 3.5 miles west of, 10 feet north of track, on east end of iron drain-pipe, marked "1515"	1,514.16
Frenchton, 50 feet west of station in south end of east abutment of railroad bridge; bronze tablet stamped "1495"	1,494.623
Frenchton, 1.1 miles west of, 5 feet south of track, chiseled square on rock ledge, marked "1411"	1,410.61
Frenchton, 2.1 miles west of, 5 feet south of railroad track, chiseled square on rock ledge, marked "1327"	1,326.56
Frenchton, 3 miles west of, 30 feet north of track, on west side of hollow, in large boulder; bronze tablet stamped "1241"	1,240.292
Crawford, in front of station; top of rail	1,103.
Crawford, 0.5 mile west of, 5 feet north of railroad, chiseled square on large boulder, marked "1090"	1,089.87
Walkerville, 60 feet west of station, in south end of east abutment of railroad bridge; bronze tablet stamped "1088"	1,087.078
Walkerville, 1.1 miles west of, 6 feet south of track, 500 feet east of wagon bridge; chiseled square on large boulder, marked "1081"	1,080.46
Walkerville, 2.2 miles west of, on north end of east bridge seat of railroad bridge; chiseled square, marked "1074"	1,073.74

	Feet.
Jacksonville, 0.2 mile north of, 6 feet east of wagon road, in rock ledge, bronze tablet stamped "1140"	1,139.094
Jacksonville, 1.4 miles north of, in east edge of road; chiseled square in large boulder, marked "1264"	1,263.69
Arnold, in front of station; top of sill	1,102.1

From Walkerville along highway south to Duffy, thence east to Selbyville.

Walkerville, 1.5 miles south of, 10 feet east of railroad track; nail in root of maple tree, marked "1091"	1,090.83
Walkerville, 2.7 miles south of, in northwest edge of wagon road, 150 feet southwest of road crossing; chiseled square on rock boulder, marked "1107"	1,106.47
Walkerville, 3.8 miles south of, 20 feet northwest of track, 300 feet northwest of house, in rock cliff; bronze tablet stamped "1134"	1,132.880
Ireland, 0.7 mile south of, 10 feet east of railroad, 15 feet northeast of road crossing; chiseled square on boulder, marked "1242"	1,241.77
Duffy, 250 feet northeast of church and schoolhouse, 60 feet north of road at forks south, in boulder in field; bronze tablet stamped "1208"	1,207.399
Duffy, 1 mile south of, 10 feet south of stream crossing, on large boulder 4 feet east of road; chiseled square, marked "1065"	1,064.58
Duffy, 2.1 miles south of, at **Bablin**, in west side of concrete bridge over Glady Fork at mouth; bronze tablet stamped "998"	997.130
Duffy, 3.1 miles southeast of, 2 feet north of road; chiseled square on rock ledge, marked "1090"	1,089.12
Ingo, at forks of road, 10 feet east of store; chiseled square on large boulder; marked "1038"	1,037.28
Ingo, 1 mile east of, at road forks, 2 feet south of; chiseled square on boulder, marked "1168"	1,166.88
Ingo, 2.3 miles east of, 3 feet north of road, in large boulder; bronze tablet stamped "1126"	1,125.492
Ingo, 3.5 miles east of, 3 feet south of road, on large boulder; chiseled square marked "1509"	1,508.00
Ingo, 3.9 miles east of, at road forks, 6 feet north of; chiseled square on boulder, marked "1644"	1,643.62
Kanawha Head, 800 feet northeast of, 20 feet northeast of road forks; chiseled square on large boulder, marked "1705"	1,704.30
Kanawha Head, 1 mile east of, 30 feet north of road, 50 feet southwest of house, in large boulder; bronze tablet stamped "1853"	1,851.840
Kanawha Head, 1.9 miles east of, 30 feet east of road; chiseled square on boulder marked "1714"	1,713.19
Kanawha Head, 3.5 miles east of, at road forks, 3 feet south of; chiseled square on boulder marked "1785"	1,784.39
Kanawha Head, 4.6 miles east of, in triangle at road forks, in large boulder; bronze tablet stamped "2125"	2,124.243
Kanawha Head, 6 miles east of, 30 feet west of stream crossing, 3 feet south of road; chiseled square on boulder marked "2214"	2,213.33
Kanawha Head, 7.4 miles east of, at north side of road, in rock ledge; bronze tablet stamped "2350"	2,349.384

	Feet.
Selbyville, in west end of north abutment of railroad bridge No. 64A; bronze tablet stamped "1888"	1,887.493
Chemical Station, spike in telegraph-pole, marked "1875"	1,874.70

ELKINS QUADRANGLE.

From Gilman Station south along Western Maryland R. R. to Elkins, thence west to Roaring Creek Junction, thence north to Belington.

Gilman, railroad crossing at station; top of rail	1,926.0
Gilman, 1,800 feet north of station, near sawmill, southeast bridge seat of iron bridge; bronze tablet stamped "Adj 1903 1926"	1,926.055
Read, in front of station; top of rail	1,918.0
Elkins, at west entrance of main building of Western Maryland Railroad, in stone step; bronze tablet stamped "1930 Adj 1903"	1,929.495
Buxton, crossing at station; top of rail	1,924.2
Elkins, 3.5 miles northwest of, in 2-inch step of southeast wing-wall of iron bridge over Tygart Valley River; aluminum tablet stamped "1914 Adj 1903"	1,913.665
Roaring Creek Junction, road crossing; top of rail	1,864.
Roaring Creek Junction, in northeast bridge seat of Coal and Coke Railroad bridge over Tygart Valley River; aluminum tablet stamped "1865 Adj 1903"	1,864.247
Harding, in front of station; top of rail	1,847.4
Junior Station, 1 mile south of, small stream at Weaver pumping station, iron-girder bridge, on 2-inch step of northwest abutment; aluminum tablet stamped "1738 Adj 1903"	1,737.193
Dartmoor, in front of station; top of rail	1,714.2

From Elkins south along highway to Beverly and return.

Elkins, 3 miles south of, Midland Schoolhouse, in west front face of foundation, 1 foot from ground and 1 foot from southeast corner of building; aluminum tablet stamped "2003"	2,002.592
Beverly, in front face, north end of door-step of public school; aluminum tablet stamped "1973"	1,972.593

From Beverly south along highways to Valley Bend, thence west to Rich Mountain, thence north along trail and highways to Roaring Creek Junction.

Beverly, 2.5 miles south of, in top face of north side of east abutment of iron highway bridge over Tygart Valley River; aluminum tablet stamped "1960"	1,959.567
Valley Bend, Crawford Schoolhouse, in rear of building, in face of foundation stone 3 feet west of northeast corner of building; aluminum tablet stamped "2042"	2,042.097
Pingley's house, 0.5 mile west of, west side of Rich Mountain, in stone at south side of road; aluminum tablet stamped "3261"	3,260.939
Fisher or Mable, 2 miles south of, 150 feet north of road fork, 40 feet west of road, in top face of very large boulder; aluminum tablet stamped "2568"	2,568.126
Coalton, in south front face of foundation corner-stone in southeast corner of Junior Mercantile Co.'s store; aluminum tablet stamped "2157"	2,157.023

FAIRMONT QUADRANGLE.

	Feet.
Grafton, Baltimore & Ohio R. R. bridge across Tygart Valley River, at north end of central pier, on coping-stone; chisel mark (Coast and Geodetic Survey bench mark "M") (1903 adjusted value = 996.856.)	996.304
Grafton, in front of station; top of rail on main line	1,000.0
Webster, Baltimore & Ohio R.R. bridge 2 over Berkeley Run, in northeast face of third stone from top of south abutment wall; bronze tablet stamped "1014 Grafton"	1,013.230
Webster, southwest of, 5.5 miles from Grafton, trestle 2⅛, on corner-stone; chisel mark (Coast Survey bench mark No. XXXI) (1903 adjusted value = 1,024.024).	1,082.088
Rosemont, road crossing near station; top of rail	1,003.
Grafton, about 2 miles east of, on corner-stone of abutment of small bridge; chiseled square (B. & O. and C. & G. S. bench mark XXX) (1903 adjusted value = 1,024.024.)	1,023.476

HACKER VALLEY QUADRANGLE.

From Bablin south along highway to Wheeler.

Bablin, 1 mile south of, at junction of Little Kanawha River and Wildcat Creek, in west side of north end of wire foot-bridge; copper nail "972.6"	972.33
Wildcat Post-office, 400 feet east of, in rock north side of road; chiseled square, painted "950.2"	949.84
Bois Post-office, at south of ford of Right Fork of Little Kanawha River, in boulder; bronze tablet stamped "1079"	1,079.147
Bois Post-office, 1.6 miles south of, in gap at head of Williams Camp Run, in root of oak, south side of road; copper nail, painted "1611.5"	1,611.31
Bois Post-office, 2 miles south of, east margin of road in rock; chiseled square painted "1513.9"	1,513.65
Wheeler Post-office, 1 mile north of, at run crossing, east margin of road, at junction with Back Fork road, in ledge; bronze tablet stamped "1438"	1,437.317
Wheeler Post-office, 0.3 mile south of, in rock east margin of road; chiseled square, painted "1474.1"	1,473.83

From point near Newlon south along Baltimore & Ohio R. R. to point near Silica.

Newlon, 1.5 miles south of, at sixty-seventh mile-post, at north side of third joint north of; top of east rail, painted "2001.8"	2,001.5
Craddock, 0.1 mile north of, in east corner of south abutment of railroad bridge 67A; bronze tablet stamped "2040"	2,039.911
Arvondale Junction, on railroad bridge 70A; top of southernmost bolt in east guard-rail, painted "2238.4"	2,238.31
Arvondale Junction, 1 mile south of, 14 rails south of seventy-first mile-post, at north side of joint; top of east rail, painted "2315.3"	2,315.0

From Hacker Valley east along Pickens & Hacker Valley R. R. to Pickens, Baltimore & Ohio R. R. (There is an error of 1 foot to be located in this line.)

	Feet.
Hacker Valley, in southeast corner-stone of residence of S. J. Cutlip; bronze tablet stamped "1501"	*1,500.848
Siding, 1 mile east of Hacker Valley, 250 feet east of switch, top of south rail on east edge of joint, painted "1616.9"	*1,616.7
Hacker Valley, 3.2 miles east of, in rock north margin of track; bronze tablet stamped "1827"	*1,826.406
Hacker Valley, 6.5 miles east of, in rock north margin of track; bronze tablet stamped "2429"	*2,429.203

PHILIPPI QUADRANGLE.

From Bridgeport via Berryburg, Switzer, and Pleasant Creek to Webster.

Berryburg, Southern Coal & Transportation Company's (Consolidation Coal Company's) tipple, west of tipple and in front of power-house, in fourth stone from top of retaining wall; bronze tablet stamped "1390 Grafton"	1,389.060
Switzer, 1.1 miles northeast of, east side of pike, on southeast corner of stone gate step of residence of B. H. Woodford; chiseled square	1,447.25
Pleasant Creek, brick residence of A. I. Cole, west corner of stone foundation, fifth stone from top and fourth from ground, 1.45 feet from corner; bronze tablet stamped "1170 Grafton"	1,169.644

From Switzer south via Philippi to Pecks Run.

Switzer, 4 miles south of, covered bridge over Tygart Valley River, in northwest corner of top stone of east abutment wall; chiseled square	1,307.61
Philippi, at north side of front entrance to brick schoolhouse in center north face of foundation stone; bronze tablet stamped "1311 Grafton"	1,310.265
Buckhannon (Tygart) Junction, plate-girder bridge 1, over Tygart Valley River, in north side of west abutment, in center of east face of first stone above bridge bed; bronze tablet stamped "1334 Grafton"	1,333.120
Volga, (3.2 miles southwest of Malta), in north abutment of Baltimore & Ohio R. R. bridge over Wash Run, in east face in center of third stone from top; bronze tablet stamped "1404 Grafton"	1,403.439
Volga, 2.5 miles southwest of, on northwest corner of north abutment of bridge over Pecks Run, in second stone from top; chiseled square	1,405.04
Pecks Run (Hodgeville), in northwest corner of south abutment of bridge over Pecks Run, on west side of second stone from corner; chiseled square	1,418.85

From Pecks Run via Peeltree and Overfield to Pepper.

Peeltree, retaining wall in front of residence of Dr. Isaac Smith, at opening for steps, west face of south wall, in center of third stone above third step from sidewalk; bronze tablet stamped "1069 Grafton"	1,068.389

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*Or 1 foot higher.

	Feet.
Peeltree, 2.9 miles north of, in front of Denver Pecken's dwelling, in third step from bottom of stone stile; chiseled square	1,093.26
Peeltree, 4.4 miles north of, on southeast corner of north abutment of iron bridge over Elk Creek; chiseled square	1,022.70
Overfield, 3.1 miles northeast of, in front of Cletus Stout's dwelling, east of stone stile, on north end of bottom step; chiseled square	1,102.71

From Pecks Run south of Buckhannon, thence northwest to Ruraldale.

	Feet.
Ruraldale, 0.6 mile west of, near fork of road by old mill, 200 feet east of residence of V. H. Reger, in face of large rock; bronze tablet stamped "1121 Grafton 1901"	1,121.768

PICKENS QUADRANGLE.

From West Huttonsville southwest along highway to Star, thence northwest along lumber railroad to Palace Valley.

	Feet.
West Huttonsville, 50 feet south of post-office, west edge of road, in front of L. M. Zickefoose's residence, in boulder; bronze tablet stamped "2322 B 7 1912"	2,321.237
West Huttonsville, 0.8 mile southwest of, north edge of road; chisel point on boulder, chiseled "2617 U. S."	2,616.94
West Huttonsville, 2 miles southwest of, 50 feet west of Left Fork of Middle Fork; spike in base of 12-inch maple tree, scribed "2473 U. S."	2,472.25
Summit of mountain, 1.4 miles east of, north edge of road; copper nail in base of 30-inch linden tree, scribed aluminum tag stamped "2824 U. S."	2,823.76
Summit of mountain, 0.2 mile east of, south side of road, in top of large boulder; bronze tablet stamped "3220 B 8 1912"	3,219.231
Summit of mountain, west of road; chisel point on boulder, chiseled "3280 U. S."	3,279.79
Star, 2.1 miles west of, north of road, opposite first house from railroad, chisel point on boulder, chiseled "3016 U. S."	3,016.04
Star, 80 feet south of West Huttonsville road crossing, 10 feet west of track, in very large rock; bronze tablet stamped "2308 B 9 1912"	2,307.783
Palace Valley, 1.7 miles southeast of, 500 feet west of switch, south edge of track; chisel point on boulder, chiseled "2205 U. S."	2,204.90

From Hacker Valley east along Pickens & Hacker Valley R. R. to Pickens, portion of line. (There is an error of 1 foot to be located in this line. See Hacker Valley Quadrangle for other bench marks.)

	Feet.
Pickens, 3.5 miles west of, 500 feet west of railroad and road crossing in gap, in rock south of margin of track; bronze tablet stamped "2883"	*2,883.095

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*Or 1 foot higher.

From Selbyville south along Baltimore & Ohio R. R. to point near Newlon.

	Feet.
Newlon, 0.5 mile south of, at sixty-sixth mile-post, at north side of third joint south of; top of east rail, painted "1929.6"	1,929.4

From Silica southeast along Baltimore & Ohio R. R. to Pickens.

Silica, 2,300 feet south of, in west corner of north abutment of railroad bridge 72A, at seventy-second mile-post; bronze tablet stamped "2385"	2,384.704
Pickens, 2 miles north of, at seventy-third mile-post, at south side of joint opposite; top of east rail, painted "2500"	2,499.7
Pickens, 1 mile north of, at seventy-fourth mile-post, at south side of first joint north of; top of west rail, painted "2615.7"	2,615.7
Pickens, in top stone in northwest corner of retaining wall at the residence of Mr. Wasmer; bronze tablet stamped "2701"	2,700.919
Pickens, 0.5 mile south of, on road to Florence, in rock west margin of highway; chiseled square, painted "2802.3"	2,802.346

From point near Samp east along highway to Monterville, thence north and west to Pickens.

Samp Post-office, 3.5 miles west of, in Big Run, in ledge north side of road; bronze tablet stamped "2022"	2,021.327
Samp Post-office, 1.2 miles west of, south edge of road, in rock; raised chiseled square, painted "2178.6"	2,178.23
Samp Post-office, 0.5 mile east of, 350 feet below Whittakers Falls, in ledge north side of road; bronze tablet stamped "2164"	2,163.708
Samp Post-office, 1.8 miles east of, up Elk River road, in rock south margin of road; raised chiseled square, painted "2271.2"	2,270.82
Store, junction of Valley and Dry Forks, 0.3 mile west of, down Elk River road, in rock north margin of road; chiseled square, painted "2270.2"	2,269.72
Blue Spring, 2.1 miles west of, at fork of road, at junction of Valley and Dry Forks, in rock north edge of road; bronze tablet stamped "2299"	2,298.369
Blue Spring Post-office, 1.1 miles west of, in rock north margin of road, chiseled square, painted "2525.5"	2,525.10
Monterville Post-office, 0.3 mile west of, down Valley Fork road ¼ mile west of summit, in rock in north margin of road; bronze tablet stamped "2949"	2,948.457
Monterville Post office, in foundation post at southeast corner of old store, at road corner; copper nail, painted "2998.3"	2,997.94
Monterville Post-office, 1.3 miles northwest of, along pike, at road corner to Logan's farm, in bed rock northwest corner; chiseled square, painted "3234.5"	3,234.12
Monterville Post-office, 2 miles northwest of, along Pickens road, 0.3 mile north of pike corner, west margin of road, in boulder; bronze tablet stamped "3237"	3,237.067
Monterville Post-office, 3.3 miles northwest of, along Pickens road, in rock west margin of road; chiseled square painted "3703.9"	3,703.56

	Feet.
Monterville Post-office, 5.8 miles northwest of, along Pickens road, in rock in east margin of road; chiseled square painted "3722.3"	3,722.00
Monterville Post-office, 7 miles north of, along Pickens road, under Whitman Knob, in rock east margin of road; bronze tablet stamped "3735"	3,734.868
Pickens, 6.2 miles southeast of, along road to Monterville, in rock south margin of road; chiseled square painted "3655.6"	3,655.23
Pickens, 5.3 miles southeast of, along road to Monterville, in ledge south edge of road, 500 yards southeast of Zehnder's farm; bronze tablet stamped "3775"	3,774.348
Pickens, 4.2 miles southeast of, along Monterville road, at 90° bend in road in front of farm of L. Wuchner, north edge of road, in rock; chiseled square, painted "3621.1"	3,620.77
Pickens, 2.5 miles southeast of, along Monterville road, under Turkeybone triangulation station in rock east edge of road; at root of tree; bronze tablet stamped "3582"	3,581.356
Pickens, 1.1 miles southeast of, along Monterville road, 0.7 mile south of fork, in rock east of margin of road; chiseled square, painted "3025.9"	3,025.37

From Monterville northeast along Valley R. R. to Lee Bell.

Brady Gate, (1.4 miles south of Monterville), 1.5 miles east of, along Elkwater road, in root of large white oak, north side of road; copper nail painted "2627.6"	2,627.19
Elkwater Camp No. 4, 70 feet in front of mess house, in rock between highway and railroad track; bronze tablet painted "2395"	2,394.079
Elkwater Camp No. 4, 1.1 miles east of, 300 feet east of house, at east side of road crossing; on north rail, painted "2290.4"	2,289.9
Spangler Station, 0.5 mile north of, at Elkwater switch, in ledge east side of track; bronze tablet stamped "2171"	2,170.846
Ninth mile-post, at north endof third joint north of post; top of west rail, painted "2137.8"	2,137.3
Lee Bell Schoolhouse, in face of foundation stone at northeast corner; bronze tablet stamped "2066"	2,065.746

SAGO QUADRANGLE.

From Buckhannon south along Baltimore & Ohio R. R. to Selbyville.

Buckhannon, Upshur County Court-House, west side of front entrance, in center of west face of base block of square column; aluminum tablet stamped "1433 Grafton"	1,432.581
Buckhannon, 3.4 miles south of, on west end of stone culvert, 10 feet west of railroad track; bronze tablet stamped "1418"	1,417.289
Buckhannon, 4.8 miles south of, 10 feet southwest of railroad track on sandstone boulder; chiseled square, marked "1430"	1,429.68
Buckhannon, 5.9 miles south of, 60 feet west of railroad track, 40 feet north of drain, in sandstone boulder; bronze tablet stamped "1434"	1,433.133
Sago, on south end of west abutment of wagon bridge over Buckhannon River; chiseled square, marked "1439"	1,438.150

	Feet.
Sago, 1.3 miles south of, 6 feet west of track, 500 feet north of house; chiseled square on sandstone boulder, marked "1452"	1,451.40
Sago, 1.8 miles south of, 6 feet west of railroad track, in rock ledge; bronze tablet stamped "1484"	1,483.484
Sago, 3.3 miles south of, 6 feet east of railroad; chiseled square on boulder, marked "1565"	1,564.58
Sago, 4.6 miles south of, between railroad and wagon road, on large boulder; chiseled square, marked "1622"	1,621.19
Tenmile, 1.2 miles south of, 75 feet west of railroad, 75 feet east of wagon road, 100 feet southwest of mile-post 54, in large boulder; bronze tablet stamped "1659"	1,658.860
Tenmile, 3.3 miles south of, 4 feet west of railroad track; chiseled square on rock ledge, marked "1710"	1,709.31
Beans Mill Station, 6 feet west of track, 100 feet southwest of store, chiseled square on large boulder, marked "1768"	1,767.30
Alton, 0.1 mile north of, 15 feet west of railroad track, 500 feet northwest of house on opposite side of river, in large boulder; bronze tablet stamped "1802"	1,801.305
Alton, in front of station; top of rail	1,799.
Alton, 1.5 miles south of, 6 feet west of railroad track; chiseled square on boulder, marked "1823"	1,822.66
Alton, 2.8 miles south of, 6 feet east of track; chiseled square on large boulder, marked "1848"	1,848.01
Alexander, 20 feet southwest of switch, 100 feet north of post-office; bronze tablet stamped "1855"	1,855.010
Alexander, 1.7 miles south of, 6 feet west of track, 400 feet west of house on opposite side of stream; chiseled square on ledge, marked "1868"	1,867.97
Alexander, 2.5 miles south of, at **Chemical Station**, 10 feet east of railroad, 50 feet north of house; spike in telegraph-pole, marked "1875"	1,874.70
Selbyville, in west end of north abutment of railroad bridge 64A; bronze tablet stamped "1888"	1,887.493

From Sago east along Coal & Coke Ry. to Midvale, thence south via lumber railroad and highway to West Huttonsville.

Sago, 0.7 mile southeast of, south edge of track, spike in base of road-crossing sign-post, scribed "1468 U. S."	1,468.09
Sago, 2 miles southeast of, south of track; chisel point on east foundation of water-tank, scribed on upright "1570 U. S."	1,569.59
Strader, 0.9 mile south of railroad bridge over creek; chisel point of east end of south abutment; chiseled "1623 U. S."	1,622.471
Strader, 50 feet northwest of station, 30 feet east of old schoolhouse, 50 feet west of track,, 50 feet north of wagon road, in boulder; bronze tablet stamped "1695 B 1 1912"	1,694.564
Goodwin, in front of center of station; top of north rail; marked "1778 U. S."	1,777.5
Goodwin, 200 feet southeast of station, 50 feet south of track; copper nail in base of 15-inch maple tree, scribed "1765 U. S."	1,764.55
Goodwin, 0.8 mile northeast of, 20 feet east of track, 20 feet north of wagon road; chisel point on boulder, chiseled "1810 U. S."	1,809.47

	Feet.
Sand Run, 1 mile west of, 500 feet east of rock quarry, 25 feet south of track; chisel point on boulder under walnut tree, chiseled "1902 U. S."	1,901.49
Sand Run, in front of station; top of rail, marked "1958 U. S."	1,957.4
Sand Run, 0.2 mile north of, 180 feet south of tunnel, 10 feet west of track, in ledge; bronze tablet stamped "1977 B 2 1912"	1,977.034
Bentley Wye, in front of station sign-board, top of west rail	1,962.0
Midvale, 0.8 mile west of, 250 feet south of old sawmill, west of track; chisel point on boulder, chiseled "1909 U. S."	1,908.84
Milvale, 200 feet south of station, in east end of north abutment of railroad bridge over Middle Fork River; bronze tablet stamped "1860 B 3 1912"	1,859.308
Ellamore, 150 feet east of post-office, 12 feet north of track; chisel point on boulder; chiseled "1842 U. S."	1,841.26
Ellamore, 1.1 miles south of, west edge of track; spike in base of 20-inch chestnut tree, scribed "U. S. 1857"	1,856.35
Ellamore, 2.9 miles south of, south edge of track, north edge of river, opposite farm house, 500 feet west of road crossing; copper nail in base of 2½-foot oak tree, scribed "1852 U. S."	1,851.99
Mouth of Kettle Run, 0.5 mile north of, 650 feet west of road crossing, 10 feet north of track, 10 feet south of wagon road, in boulder; bronze tablet stamped "1869 B 4 1912"	1,868.170
Mouth of Kettle Run, 0.7 mile south of, west edge of track; chisel point on boulder; chiseled "1878 U. S."	1,877.23
Top of west rail at road crossing near old bridge, painted on Crossing "1866 U. S."	1,885.9
Mouth of Kettle Run, 1.6 miles south of, 40 feet north of track, in center of road; chisel point on boulder, chiseled "1896 U. S."	1,895.56
Cassity, 3.2 miles north of, west edge of track, east edge of river; copper nail in base of 1½-foot gum tree, scribed "1936 U. S."	1,935.97
Cassity, 1.4 miles north of, east edge of track, 350 feet north of road crossing, in boulder; bronze tablet stamped "1991 B 5 1912"	1,990.930
Cassity, 300 feet south of boarding house, 300 feet south of lumber company's engine house, 50 feet south of Cassity Fork, 35 feet southeast of track; copper nail in base of 18-inch spruce tree, scribed "2021 U. S.," aluminum tag stamped "2021 U. S."	2,020.18
Cassity, 0.8 mile outh of, east end of south abutment of wagon bridge over Middle Fork River; chisel point, chiseled "2046 U. S."	2,045.25
Cassity, 2.4 miles south of, 40 feet east of track, 0.8 mile north Stonecoal Run, 250 feet south of farm house, 100 feet west of wagon road; in ledge; bronze tablet stamped "2101 B 6 1912"	2,100.164
Mouth of Stonecoal Run, 150 feet north of, west edge of track, 100 feet south of house; copper nail in base of 3-foot, spruce tree, scribed "2119 U. S." aluminum tag stamped "2119 U. S."	2,118.28
Mouth of Stonecoal Run, 1 mile south of, west side of river where railroad right of way crosses it; copper nail in base of 2-foot birch tree, scribed; aluminum tag stamped "2158 U. S."	2,157.90

	Feet.
West Huttonsville, 1.9 miles north of, 600 feet south of mouth of Laurel Creek, 200 feet south of foot-bridge, west edge of road, east edge of rock, 600 feet west of farm house; chisel point on bolder, chiseleud "2214 U. S."	2,213.37
West Huttonsville, 1.1 miles north of, west edge of road at forks, 700 feet north of farm house; chisel point on boulder; painted "2264 U. S."	2,263.41

From Palace Valley along lumber railroad to Alexander.

Palace Valley, 300 feet south of road crossing, 20 feet east of track, in boulder; bronze tablet stamped "2102 B 10 1912"	2,101.344
Shahan, top of south rail at road crossing in front of station; painted on platform "2025 U. S."	2,025.1
Alexander, 3.3 miles east of, south edge of track; chisel point on boulder, chiseled "2001 U. S."	2,000.44
Alexander, 2.4 miles east of, north edge of track; chisel point on boulder, chiseled "1957 U. S."	1,957.00
Alexander, 1 mile east of, east edge of track at road crossing; chisel point on boulder, chiseled "1878 U. S."	1,877.77
Alexander, 20 feet southwest of switch, 100 feet north of post-office; bronze tablet stamped "1855"	1,855.010

THORNTON QUADRANGLE.

From Grafton east along highway via Knottsville, Sinclair, and Fellowsville to Tunnelton.

Knottsville, 200 feet south of post-office, in large rock on east side of road, opposite house of W. E. Wilson; bronze tablet stamped "1484 Adj 1903"	1,483.264
Claude, 1 mile northwest of, 3.1 miles southeast of Knottsville, 10 feet south of center of road, in large rock; bronze tablet stamped "1418 Adj 1903"	1,417.588
Dent, opposite post-office, west side of road, 300 feet south of covered bridge over Sandy Creek, in large rock; bronze tablet stamped "1326 Adj 1903"	1,325.249
Sinclair, 1 mile northeast of post-office, 250 feet north of forks, in large rock on east side of road; bronze tablet stamped "1489 Adj 1903"	1,488.456
Sinclair, 3.4 miles north of post-office, 0.2 mile north of forks of road, 0.1 mile south of residence of H. Goff, west side of road, in large rock; bronze tablet stamped "1408 Adj 1903". (The true elevation is possibly 1 foot greater)	1,407.685

Bench mark near Grafton.

Grafton, about 2 miles east of, on corner-stone of abutment of small bridge; chiseled square (B. & O. and C. & G. S. bench mark XXX) (1903 adjusted value = 1,024.024.)	1,023.476

From Austen west along Baltimore & Ohio R. R. to Grafton.

Grafton, about 2 miles east of, east abutment of bridge 100, set between tracks in bridge seat; copper bolt (B. & O. bench mark 100)	1,021.294

	Feet.
Grafton, 1.2 miles east of, at mile-post 279; section of rail set vertically in ground between tracks (B. & O. bench mark 101)	1,007.140

WESTON QUADRANGLE

From Ruraldale north via Johnstown to Quiet Dell, thence southwest to West Milford, thence north to Clarksburg.

Johnstown, 0.1 mile west of, in face of ledge of rock north of road; bronze tablet stamped "1062 Grafton 1901"	1,062.546
Quiet Dell, 0.5 mile south of, 600 feet from crossroads, in large boulder on west side of road; aluminum tablet stamped "1050 Grafton 1901"	1,050.378
West Milford, at southwest corner of highway bridge over West Fork River, in top of bridge seat; bronze tablet stamped "979 Grafton 1901"	978.965

From West Milford south along highways to Weston.[*]

Jane Lew, southeast end of railroad bridge over Hackers Creek, in top of first stone below bridge seat; aluminum tablet stamped "1007 Grafton 1901"	1,006.647

From Weston along road to Ruraldale.

Weston, at end of southwest pier of Baltimore & Ohio R. R. bridge 24A over West Fork River; bronze tablet stamped "1017 Grafton 1901"[‡]	1,008.903

From Weston south along Baltimore & Ohio R. R. to Brownsville.

Weston, 0.5 mile south of, on northeast corner of south abutment of railroad bridge 25C; chiseled square	1,017.37
Brownsville, on northeast corner of west abutment of covered bridge; chiseled square	1,027.81

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[*] The error distributed in this line is excessive.

[‡] This description and corrected elevation were furnished by the Chief Engineer of the Baltimore & Ohio Railroad after reconstruction of pier.

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